



Overview

- mercury lamps in the EU -

Peter Maxson
Concorde East/West Sprl

“Mercury containing lamps under the spotlight”

Workshop organized by:

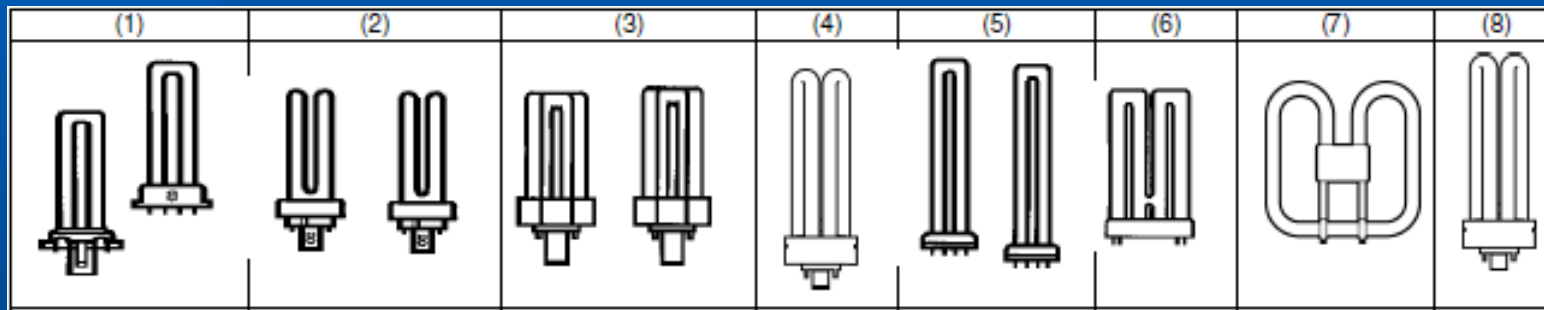
European Environmental Bureau - EEB
Zero Mercury Working Group - ZMWG

CENELEC, Brussels -- 27 June 2008

(this presentation was revised 30 June 2008 in order to reflect better data available at the workshop)

photo courtesy of www.kingsway.de

Part I – Mercury consumption in EU lamps



Part II – CFLs vs. incandescents

Part I – EU mercury consumption in lamps

- **2004 rough estimate of 35 metric tonnes Hg consumed for EU lamps**
- **Recently I have refined and updated that estimate to 2006**
- **The following approach was used**

Hg lamps - EU trade with third countries

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- **European Lamp Companies Federation, ELC, does not publish information on imports and exports**
- **The COMEXT database gives imports and exports - reasonably reliable Customs data**
- **The PRODCOM database gives EU production statistics - as reliable as national reporting**

EU import/export of mercury lamps (tonnes)

COMEXT code & lamp types		2000	2003	2006
8539 31 10 –(tubes) DISCHARGE LAMPS, FLUORESCENT, HOT CATHODE, WITH DOUBLE ENDED CAP	EU27_extra import	3,482	3,081	7,175
	EU27_extra export	22,441	20,548	26,759
8539 31 90 – (CFLs) DISCHARGE LAMPS, FLUORESCENT, HOT CATHODE (EXCL. WITH DOUBLE ENDED CAP	EU27_extra import	6,680	9,201	22,200
	EU27_extra export	6,181	5,920	4,945
8539 32 10 – (HID-1) MERCURY VAPOUR LAMPS	EU27_extra import	594	393	1,065
	EU27_extra export	1,030	838	317
8539 32 50 – (HID-2) SODIUM VAPOUR LAMPS	EU27_extra import	130	349	481
	EU27_extra export	924	773	567
8539 32 90 – (HID-3) METAL HALIDE LAMPS	EU27_extra import	372	773	1,029
	EU27_extra export	516	513	1,392
8539 39 00 – (other) DISCHARGE LAMPS (EXCL. FLOURESCENT, HOT CATHODE LAMPS, ULTRAVIOLET LAMPS, ETC.)	EU27_extra import	1,349	2,562	2,062
	EU27_extra export	1,036	1,728	802

Source: COMEXT database

EU import/export of mercury lamps

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- **Note 1 - in nearly all lamp categories, EU imports have increased by 2-3 times over a 6-year period**
- **Note 2 - only in the category of metal halide lamps have EU exports increased as much**
- **convert the volumes of lamps imported and exported to lamp units**
- **combine import and export data with production data from the PRODCOM database**
- **calculate EU consumption of different lamp types**

EU market for mercury lamps (2006) – p.1

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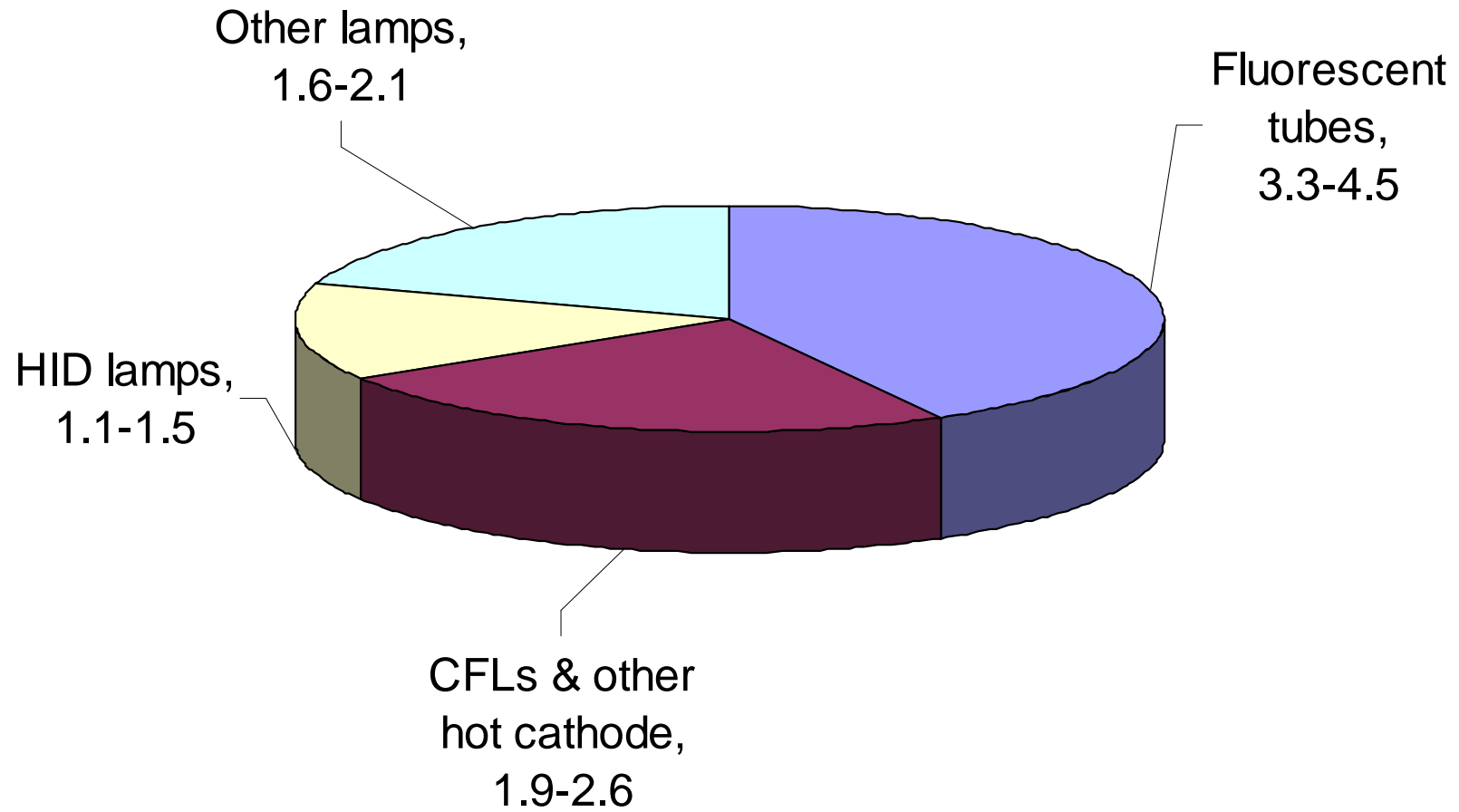
EU27 market for mercury containing lamps (2006)		Units (million)	Hg content (g/unit)	Hg content (tonnes)	Estimated Hg range (t)
Fluorescent tubes	EU27_production	552	0.010	5.52	
	EU27_extra import	60	0.010	0.60	
	EU27_extra export	223	0.010	2.23	
	EU27_consumption	389	0.010	3.89	3.3-4.5
CFLs	EU27_production	255	0.005	1.28	
	EU27_extra import	247	0.005	1.23	
	EU27_extra export	55	0.005	0.27	
	EU27_consumption	447	0.005	2.23	1.9-2.6

EU market for mercury lamps (2006) – p.2

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EU27 market for mercury containing lamps (2006)		Units (million)	Hg content (g/unit)	Hg content (tonnes)	Estimated Hg range (t)
HID lamps	EU27_production	39	0.030	1.18	
	EU27_extra import	15	0.030	0.44	
	EU27_extra export	12	0.030	0.35	
	EU27_consumption	42	0.030	1.27	1.1-1.5
Other lamps	EU27_production	81	0.025	2.03	
	EU27_extra import	29	0.025	0.72	
	EU27_extra export	35	0.025	0.88	
	EU27_consumption	75	0.025	1.86	1.6-2.1
TOTAL	EU27_production	928	0.011	10.01	
	EU27_extra import	350	0.009	2.99	
	EU27_extra export	325	0.012	3.74	
	EU27_consumption	953	0.010	9.26	7.9-10.7

Mercury in lamps, EU25, 2006 (metric tons)

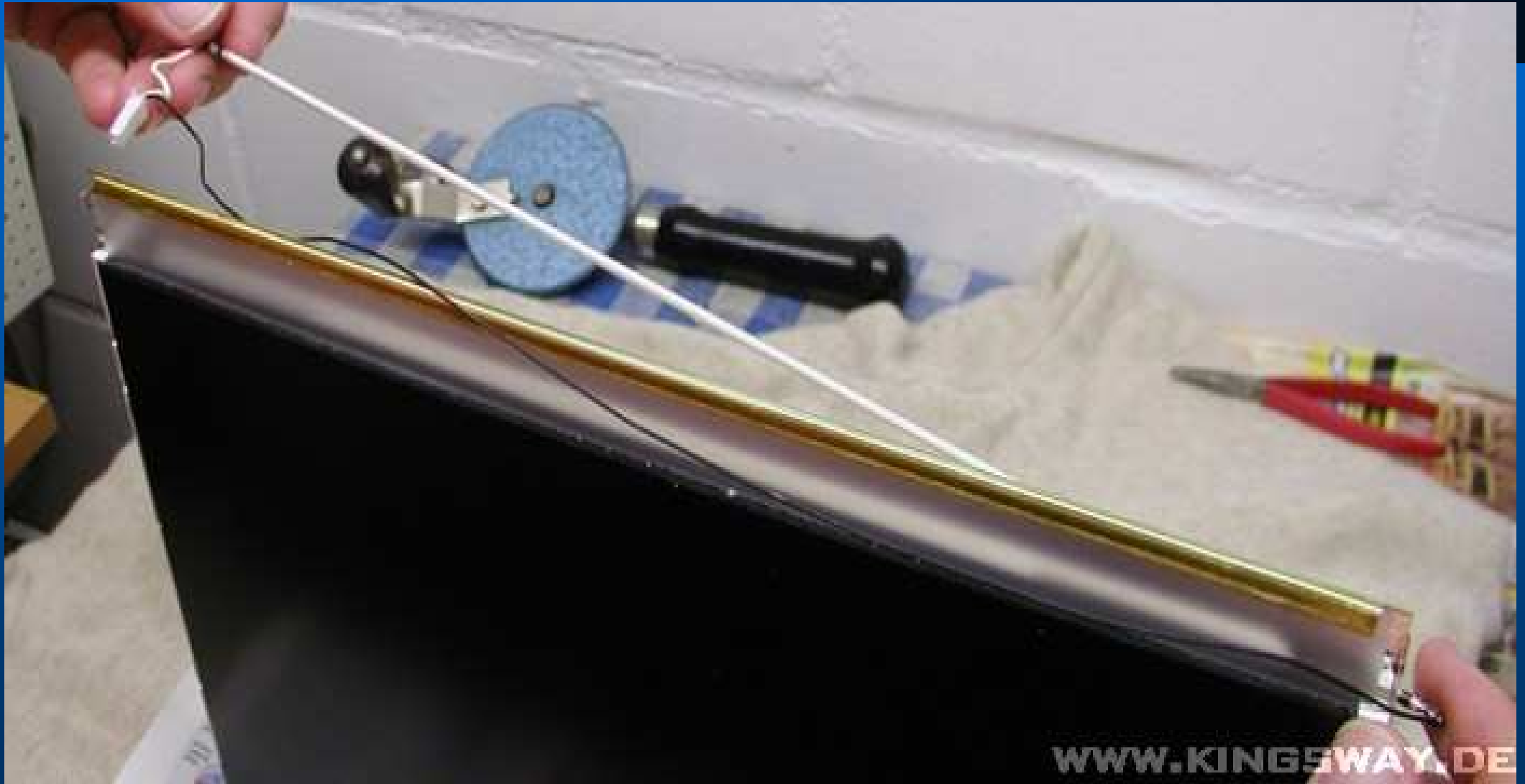


Observations about the EU market

- **More lamps than previously estimated for EU**
- **Compare with average Hg content (11.5 mg) and 668 million Hg lamps sold in the US in 2005 (Cain *et al.* 2007)**
- **Note that Hg lamps sold in a given year contain far less Hg than lamps going into the waste stream the same year**
- **These conclusions are only as good as COMEXT and PRODCOM data, and estimates of mercury content for various lamps**
- **Additional data is more than welcome!**

Mercury lamps - backlighting

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- **Fluorescent lamps have been industry standard for most backlighting applications**
- **“Special purpose” fluorescent lamps are exempted from RoHS Directive**
- **Less attention of manufacturers to Hg content**
- **Recent shift to LED backlighting for cameras, audio equipment, telephones, etc.**
- **So far, LED backlights used mostly for small screens, also some (and increasingly) larger screens**
- **National statistics available for the UK →**

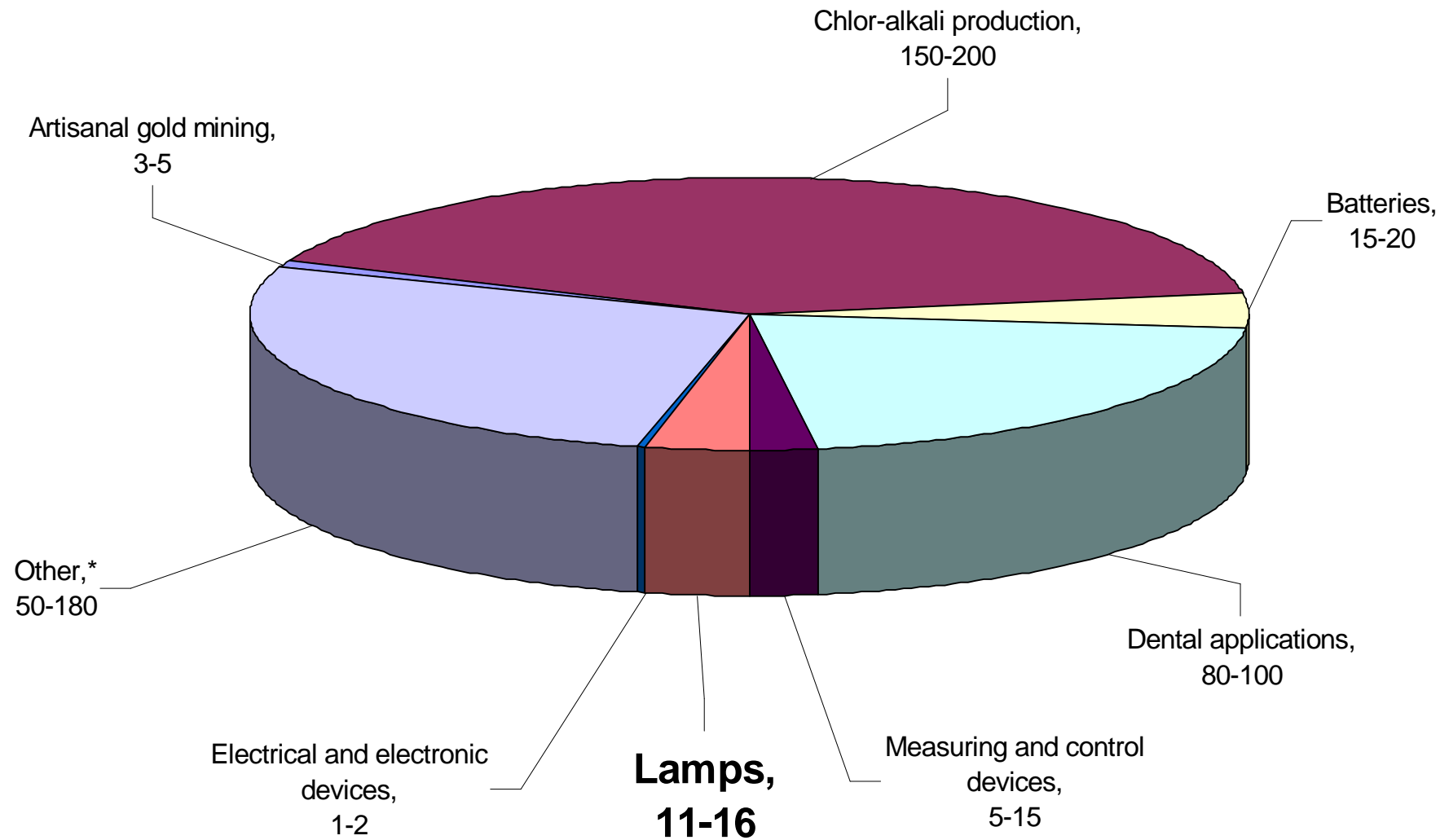
Backlighting – some UK examples from AEA

Device	UK total demand 2007 (millions)	Mercury content product range (mg)
Multi-media monitor	0.2	75.0
LCD display monitor	10.5	2.5
		7.5
		30.0
LCD TV flat panel	3.0	2.5
		7.5
		30.0
Digital picture frame	0.5	2.5
LCD projector	0.1	75.0
Laptop/notebook	8.0	2.5
		30.0
Fax/copier/printer	2.5	2.5
		30.0
Fax	0.1	2.5
Scanner	0.5	2.5
		30.0
Copier	0.5	2.5
		7.5

Quick calculation of Hg use:

- Allocate UK total demand for each device
- Calculate UK backlighting Hg consumption, i.e. ~400 kg
- Extrapolate to the EU on the basis of population and relative purchasing power
- EU backlight Hg consumption = 3-4 metric tons
- Compare to Hg in largest lamp category – fluorescent tubes

EU25 mercury consumption, metric tons (2006)



*pesticides, fungicides, catalysts, chemical intermediates, porosimeters, pycnometers, pharmaceuticals, traditional medicine, cultural and ritual uses, etc.

Source: Maxson, draft estimates prepared for UNEP, May 2008.

Other elements of Hg mass balance - lamps

- **Includes historic lamp and Hg consumption**
 - Estimated “inventory” of 4-4.5 billion general purpose Hg lamps installed in the EU
 - containing ~50 tonnes Hg, plus ~15 tonnes in lamps used for backlighting
- **Indicates how much Hg is recycled, etc.**
 - Est. collection 30-40% of general purpose lamps
 - Est. recycled 40-60% of lamps collected

CFLs vs. incandescents

Lots of recent attention to trade-offs, esp.

- **Total energy consumption**
- **CO₂ emissions**
- **Hg releases**

Why shift to CFLs?

According to the US EPA:

1. CFL is a “drop-in” substitute for incandescent
2. Up to 75% less electricity consumption
3. Substantially less CO₂ generation
4. Up to 10 times longer lifetime
5. Quick return-on-investment
6. Only 11% of Hg content would be released when a CFL is landfilled
7. The total Hg release is far lower when using a CFL than when using equivalent incandescents
8. [No mention of “power factor”]

Main CFL advantage

While improved energy efficiency is the over-riding benefit of CFLs, a better balanced perspective will encourage a more healthy debate

In particular, the issue of Hg releases has received wide press coverage

EPA claims total Hg releases far lower for CFL

However, Hg releases vary with:

- the percentage of coal in the fuel mix
- the Hg content of the coal in the fuel mix
- The extent of Hg controls on coal combustion flue gases
- The assumed lifetime of a CFL
- The Hg content of the CFL
- The rate of secure collection of waste CFLs
- The disposal pathways for CFLs not collected
- Etc.

US EPA-type scenario

US EPA-type scenario (see EPA website)	CFL	Incandescent
CFL Hg content (mg Hg)	4	0
CFL watts to produce lumens equivalent to 60w incandescent lamp	13	60
CFL lifetime (hrs.)	8000	8000
Average Hg emissions generating electricity, after emissions controls, using 100% coal (mg Hg/kwh)	0.024	0.024
Average coal/fuel mix for actual electricity generation (% coal)	50%	50%
CFL recycling and secure disposal rate (% of total CFLs marketed)	22%	0%
Other CFLs to incineration (% of total CFLs marketed)	14%	0%
Other CFLs to landfill (% of total CFLs marketed)	64%	0%
% Hg released from incineration (% of total Hg in CFL)	30%	0%
% Hg released from landfill (% of total Hg in CFL)	11%	0%
Total Hg releases from electricity generation & disposal (mg)	1.7	5.8

EU scenario requires different assumptions

EU scenario - reflecting EU circumstances	CFL	Incandescent
CFL Hg content (mg Hg)	5	0
CFL watts to produce lumens equivalent to 60w incandescent lamp	18	60
CFL lifetime (hrs.)	8000	8000
Average Hg emissions generating electricity, after emissions controls, using 100% coal (mg Hg/kwh)	0.024	0.024
Average coal/fuel mix for actual electricity generation (% coal)	30%	30%
CFL recycling and secure disposal rate (% of total CFLs marketed)	30%	0%
Other CFLs to incineration (% of total CFLs marketed)	16%	0%
Other CFLs to landfill (% of total CFLs marketed)	54%	0%
% Hg released from incineration (% of total Hg in CFL)	70%	0%
% Hg released from landfill (% of total Hg in CFL)	30%	0%
Total Hg releases from electricity generation & disposal (mg)	2.4	3.5

- **OBSERVATION: Reduced Hg releases through use of CFLs may not be overwhelming, depending on the region or country**
- **The great benefit of CFLs is ENERGY EFFICIENCY**
- **But “selling” CFLs to the public will be much more difficult if the mercury savings are small or unclear**
- **CFLs can only achieve their market potential if they are not saddled with such an image**

Therefore it is critical to:

- **reduce to an absolute minimum the Hg content of CFLs, i.e. <2 mg, and other Hg lamps.**
- **maximize the lifetime and lumens/watt of all Hg lamps**
- **maximize the recycling or secure disposal of all Hg lamps**

These objectives could be more rapidly achieved by consumers who have access to relevant information through appropriate labeling