

End Of Life Management of Portable Ni-Cd Batteries

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RECHARGE aisbl

DG Environment - Stakeholder Meeting
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- 1. Introduction: the Batteries Directive requirements**
- 2. Recycling Ni-Cd batteries**
- 3. End of Life (Emissions)**
- 4. Conclusions**

Batteries Directive Requirements

According to BD 2006/66/EC, Portable Ni-Cd Batteries are authorized to be placed on the market in Cordless Power Tools (CPT)

OEMs selling CPT have to register as producers and participate to Waste Batteries Collection Schemes and their financing

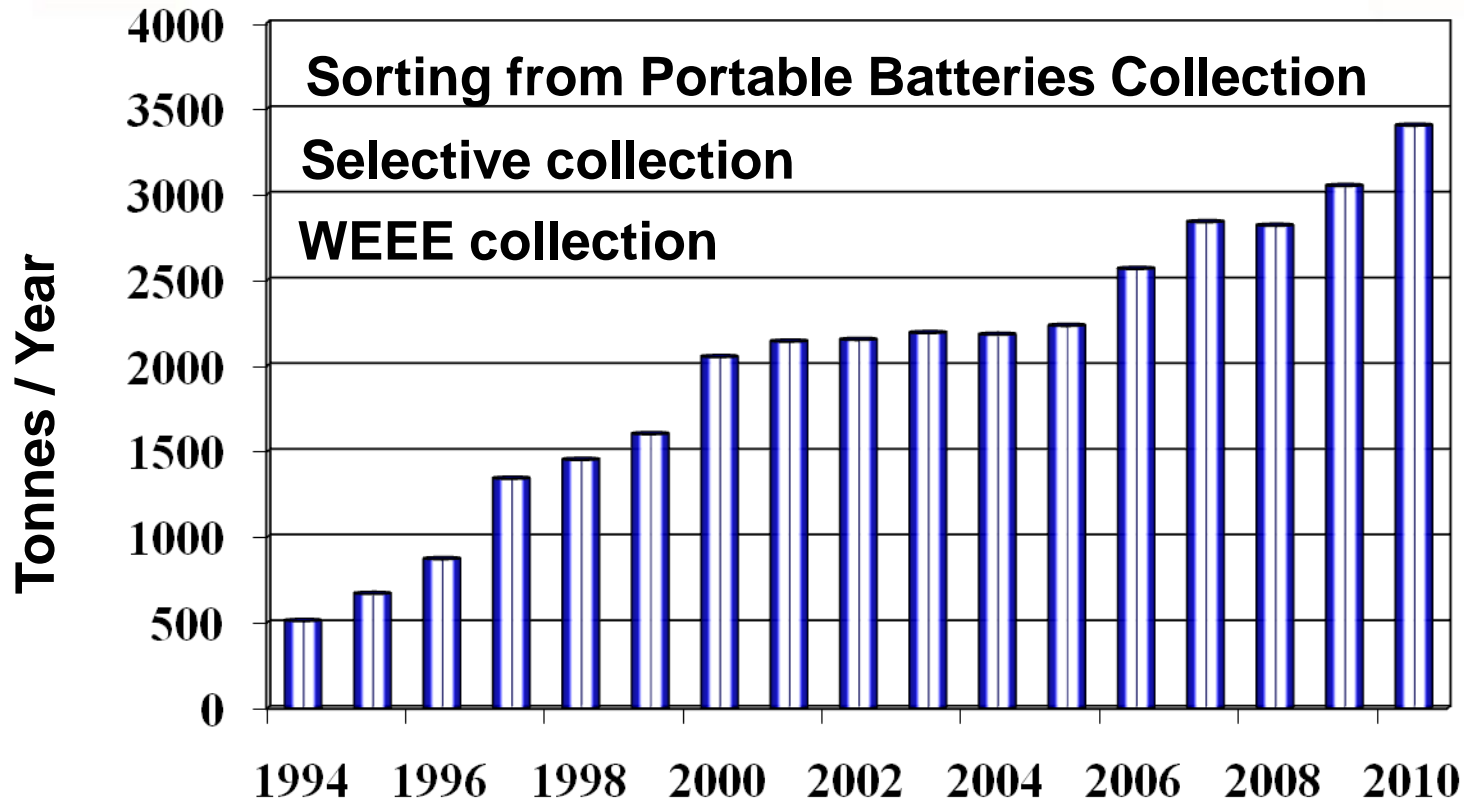
Ni-Cd batteries are collected with other types of portable batteries or selectively

All collected Portable Ni-Cd batteries have to be recycled

EU-based Ni-Cd battery recyclers are operating for more than 20 years

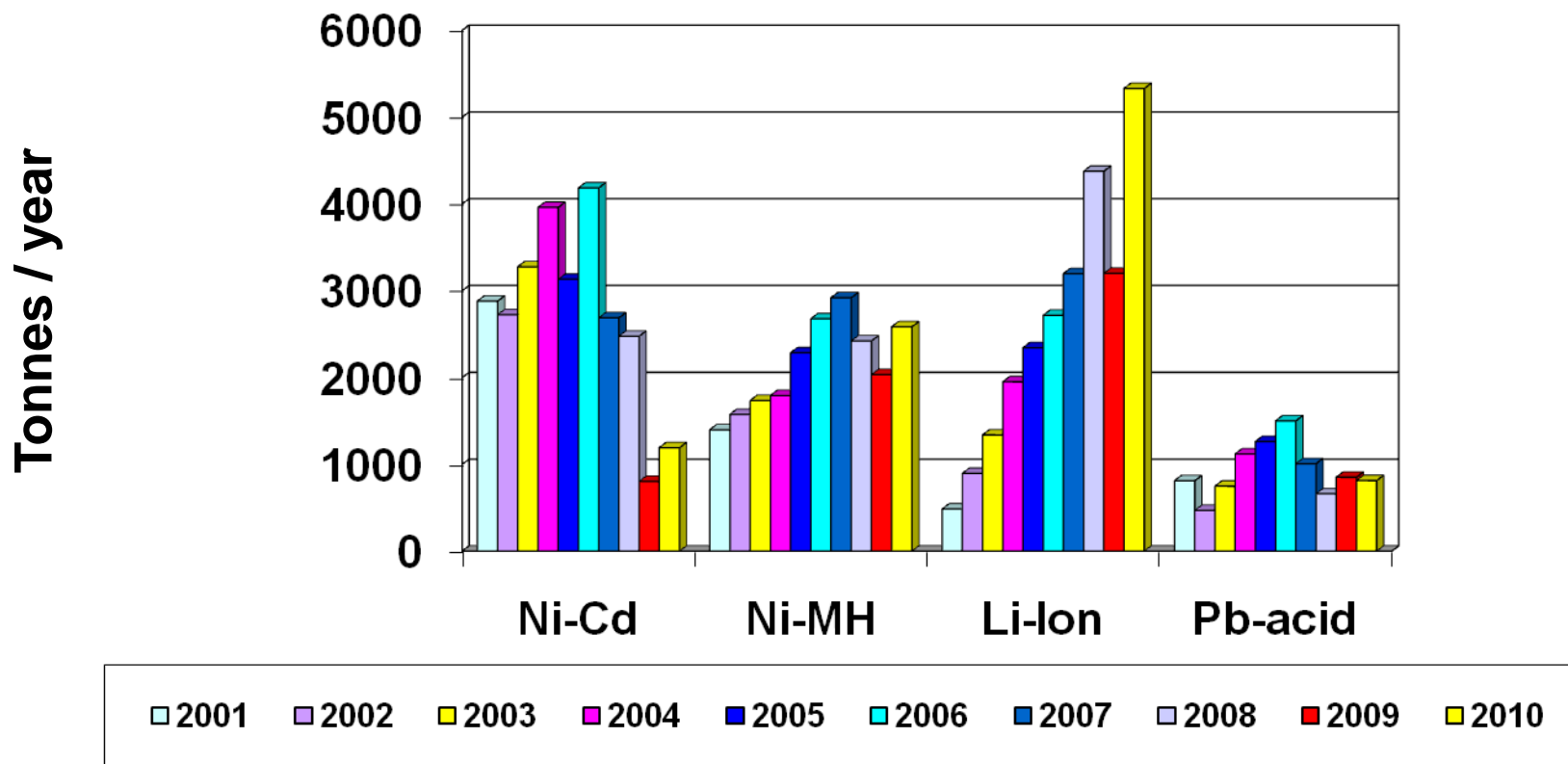
For many years, Industry has been able to quantify the flow of Ni-Cd batteries in/out the market

**Spent Portable Ni-Cd Batteries from European Sources
collected separately and processed at Recycling Plants
27 EU MS + N + CH**



Market Data (GERMANY)

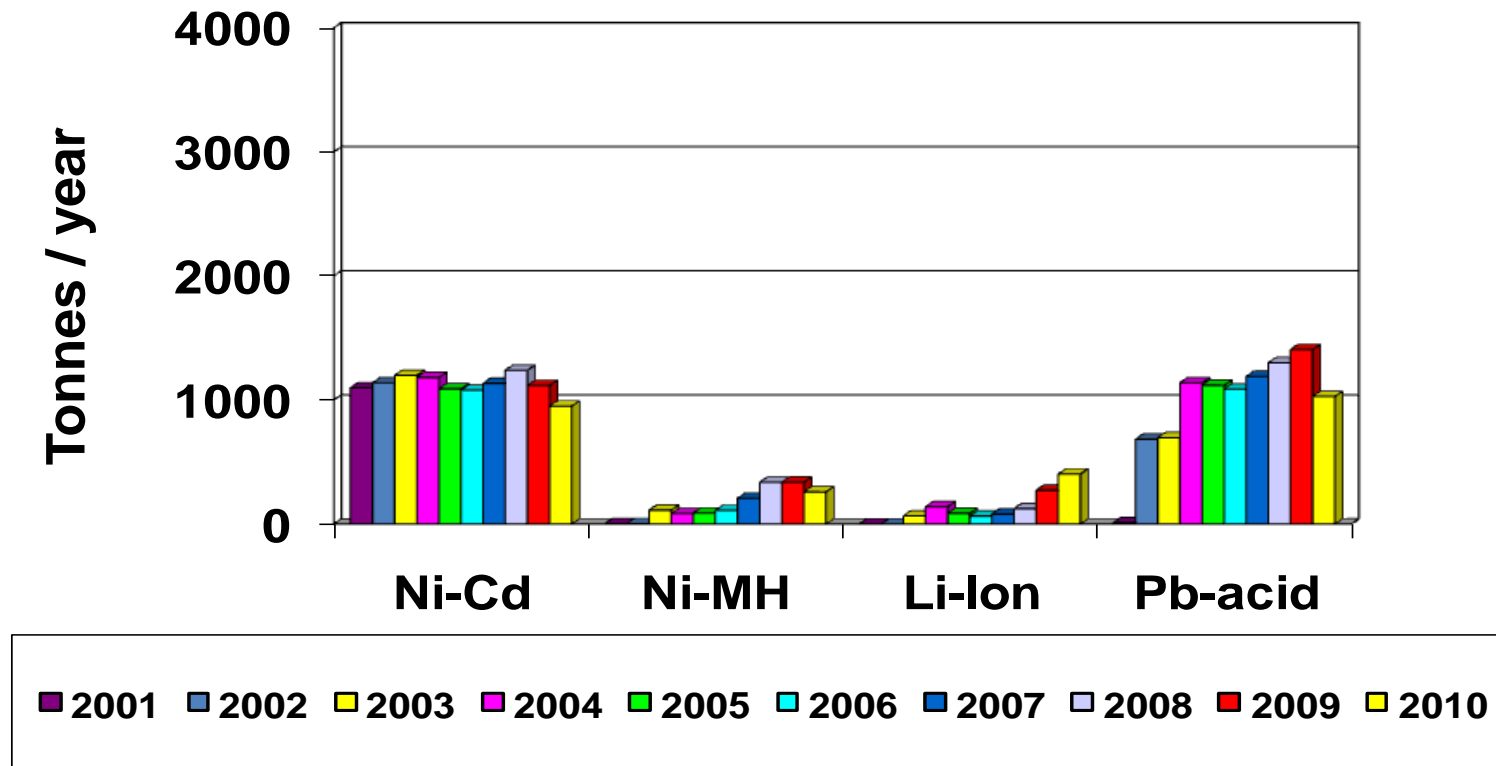
NB data by weight - Portable Rechargeable Batteries



Data for Germany : consolidated from GRS + Bosch Rec. + CCR-REBAT

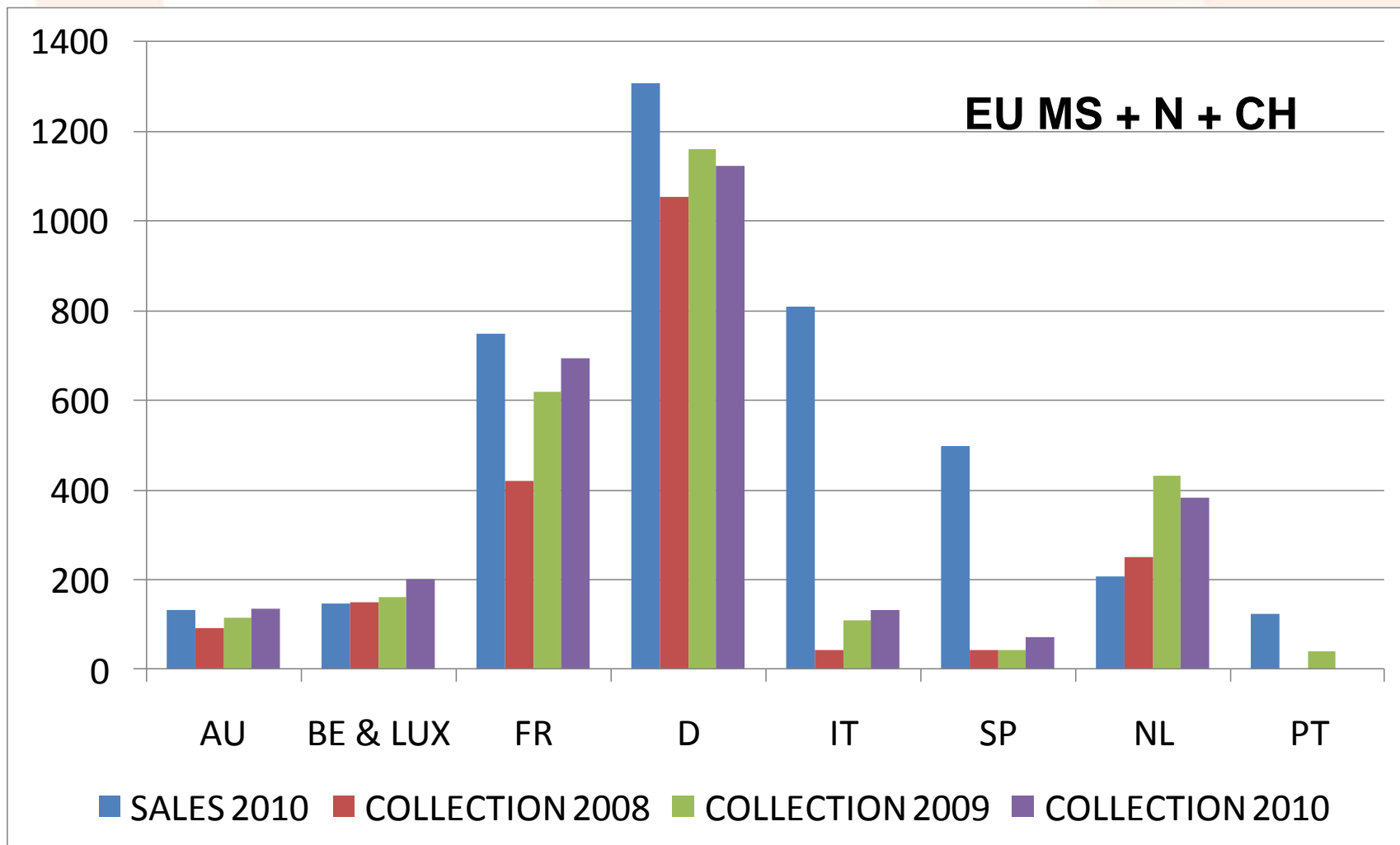
Collection Data (GERMANY)

Quantities of Portable Rechargeable Batteries Collected per year

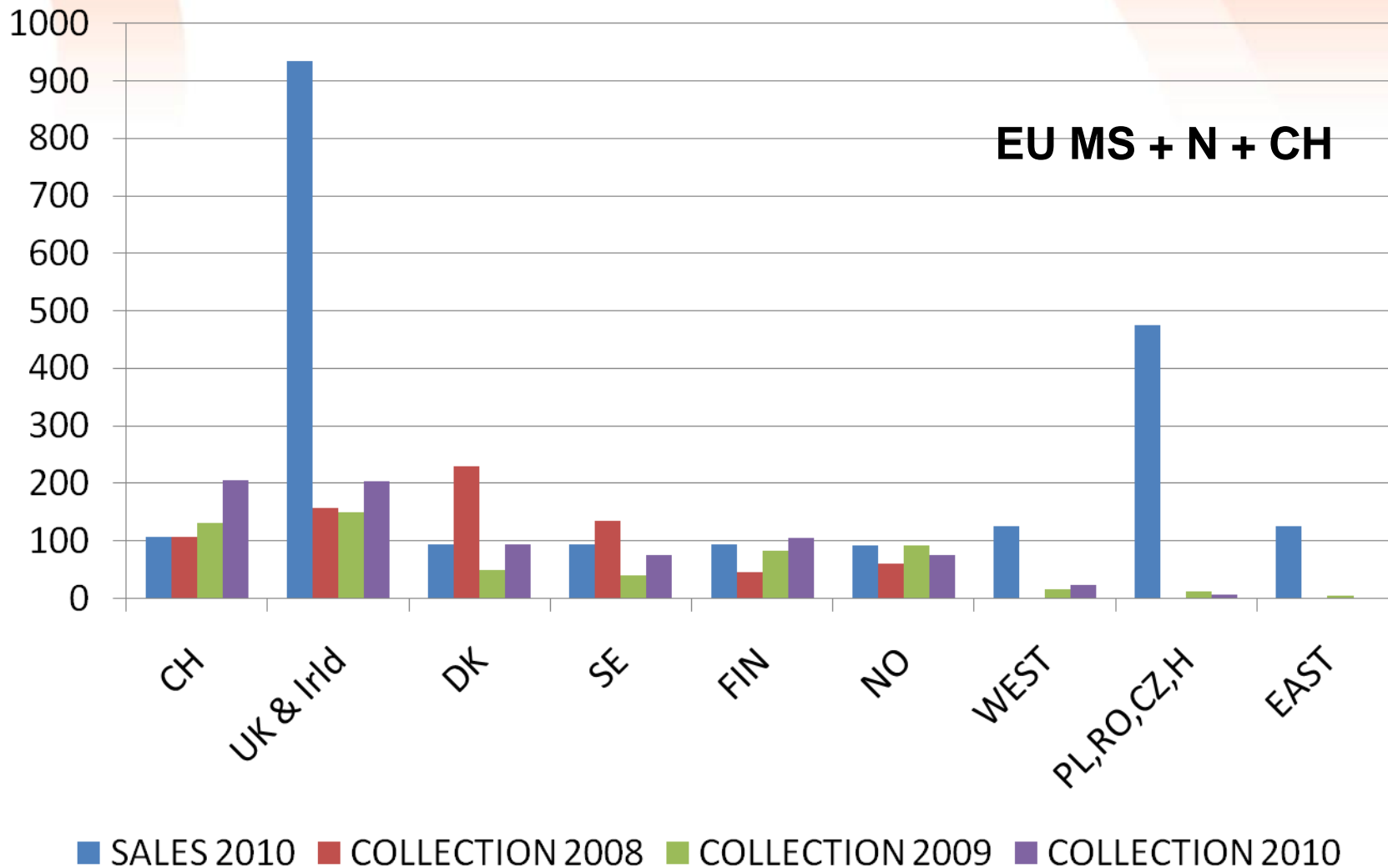


Data for Germany : consolidated from GRS + Bosch Rec + CCR REBAT.

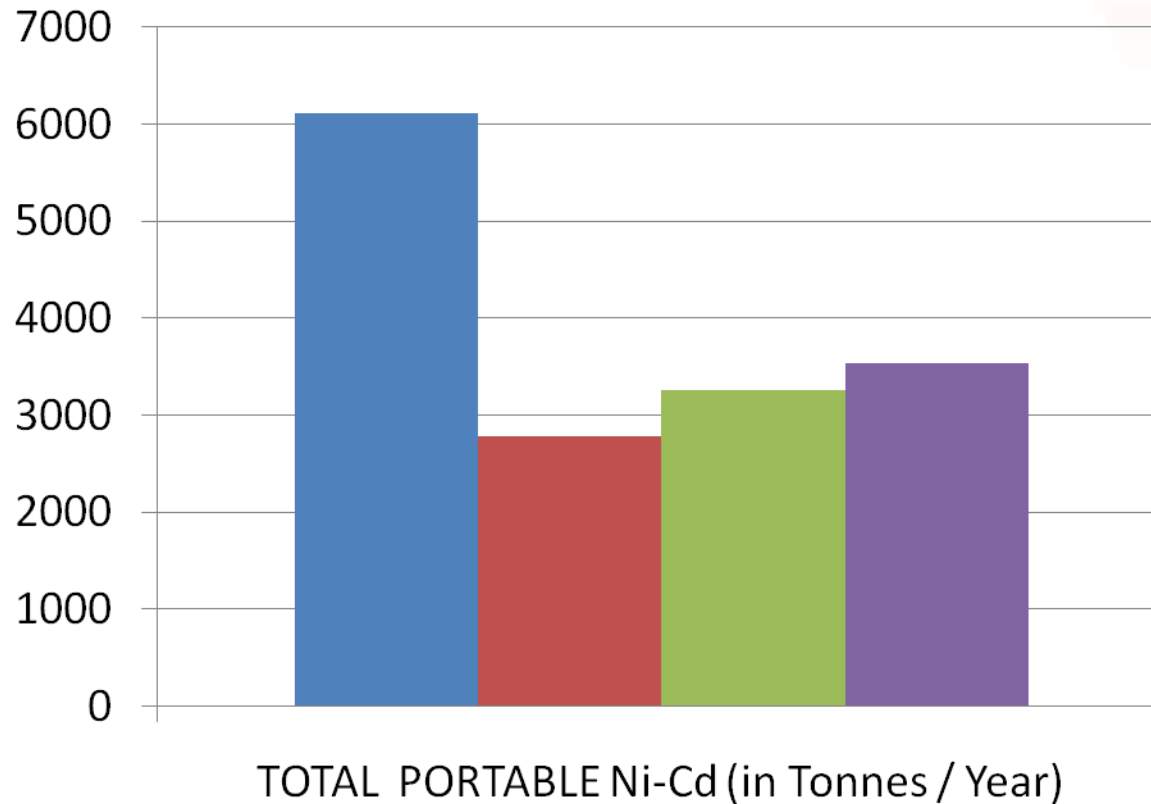
Comparison between estimated sales of portable Ni-Cd batteries (CPT Application) & waste portable Ni-Cd collected (in Tonnes / year).



Comparison between estimated sales of portable Ni-Cd batteries (CPT Application) & waste portable Ni-Cd collected (in Tonnes / year)



Comparison between estimated sales of portable Ni-Cd batteries (CPT Application) & waste portable Ni-Cd collected (in Tonnes / year). TOTAL EU 27 + N + CH



■ SALES 2010 ■ COLLECTION 2008
■ COLLECTION 2009 ■ COLLECTION 2010

The Batteries Directive is reviewing the use of Portable Ni-Cd Batteries in Cordless Power Tools.

**Data are available on Sales and Collection of these batteries at MS level
NB Data were already made available for the TRAR (2003)**

OEMs are Members of Collection Schemes in all Member States

The quantities of Ni-Cd collected are increasing regularly.

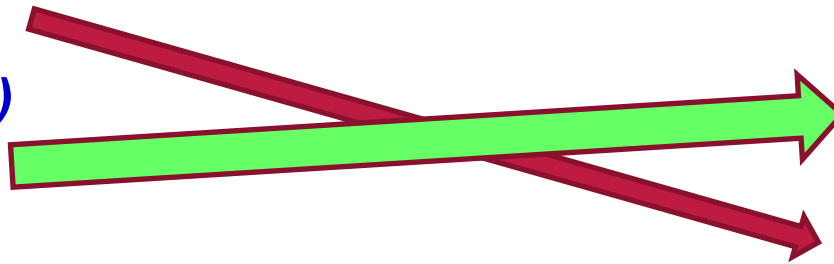
**The Collection Efficiency expressed on a Waste/Sales basis is > 50 %
at EU level**

**Currently the collection efficiency (CE) of Ni-Cd is higher than the CE
of other technologies**

DECOUPLING of COLLECTION vs SALES

SALES

(1)

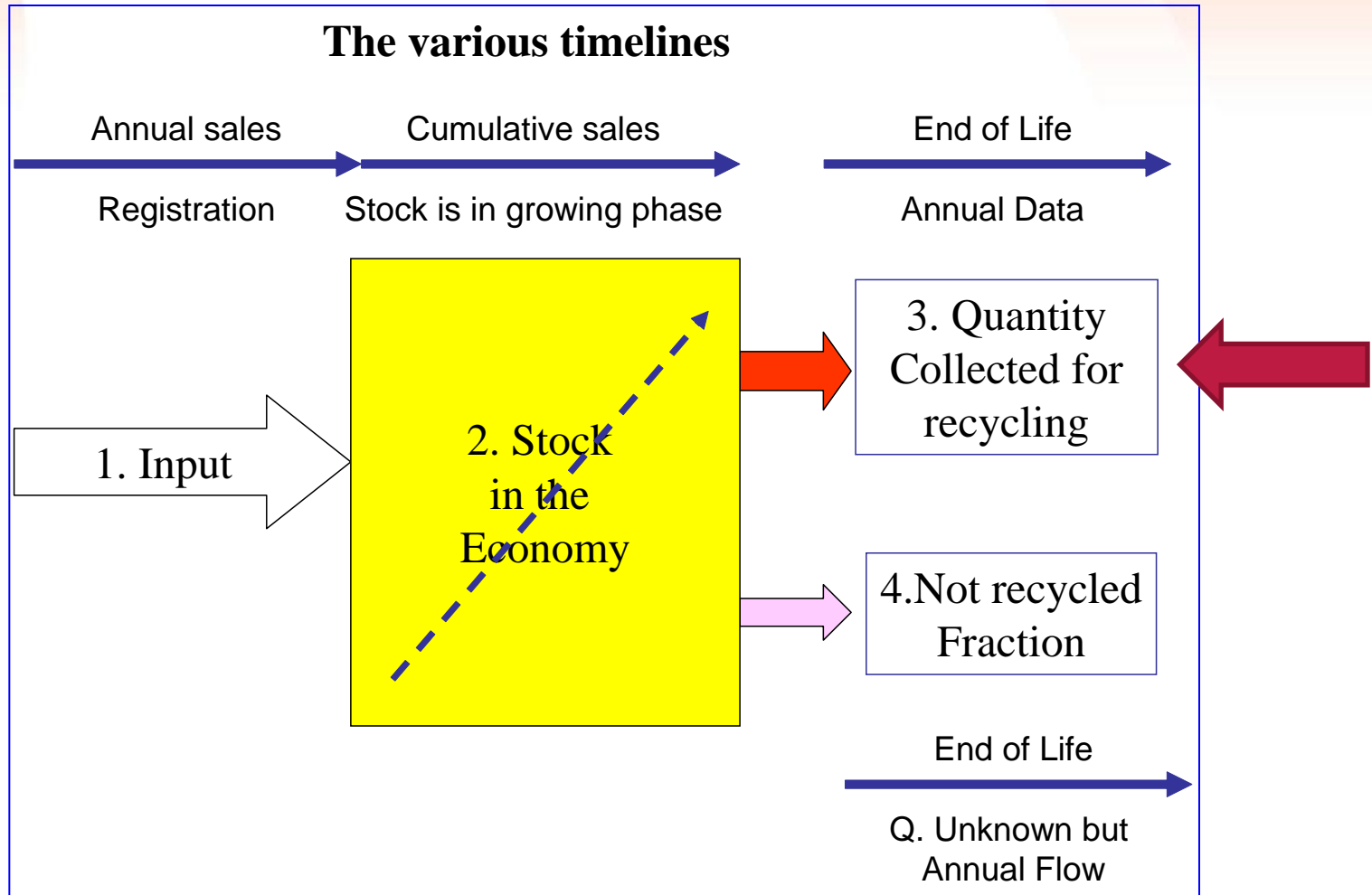


(2)

COLLECTION

- (1) MS where Collection starts*
- (2) MS where Collection started 5-10 y ago*

2. RECYCLING Ni-Cd BATTERIES

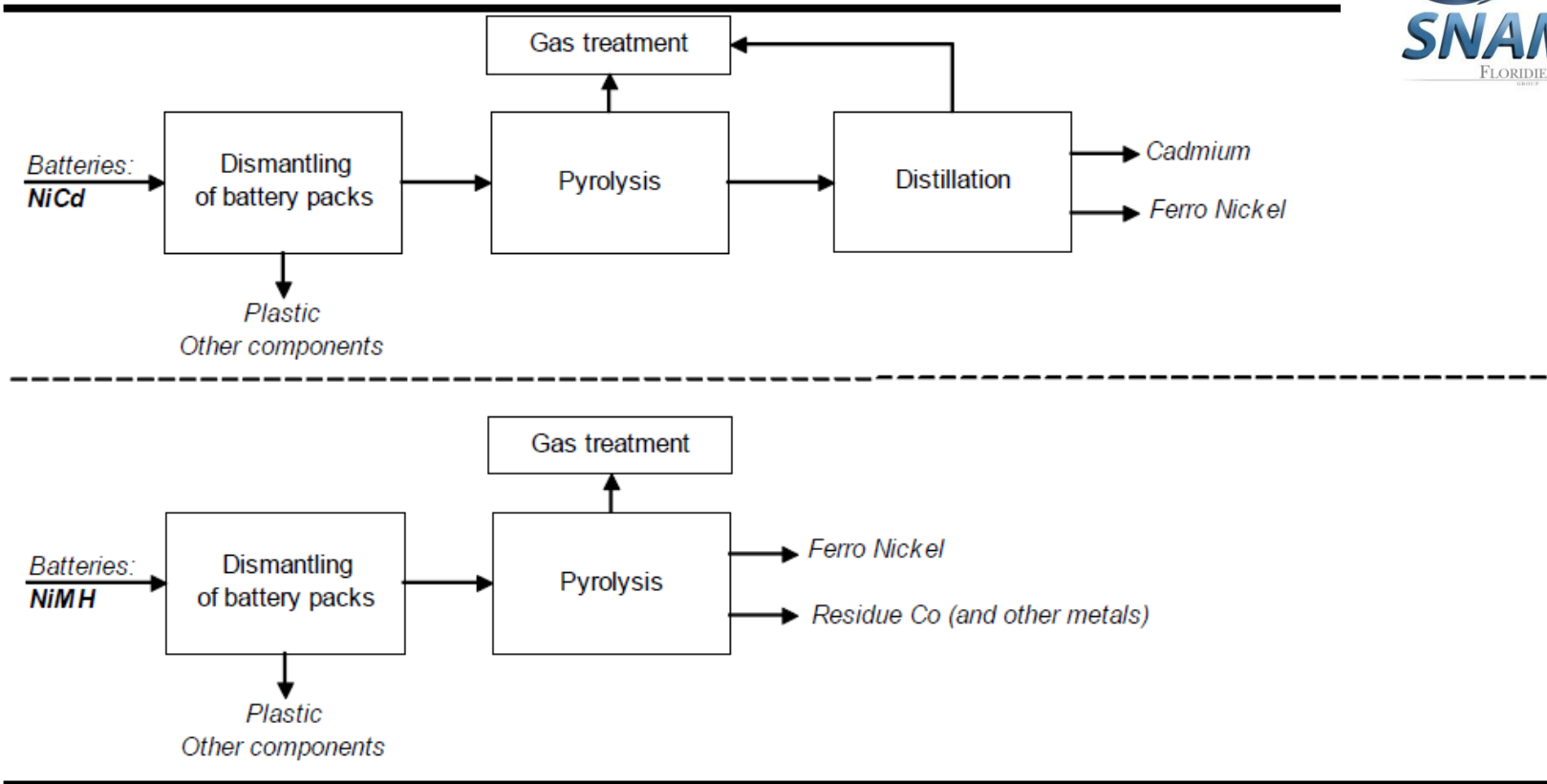


2. RECYCLING Ni-Cd BATTERIES

1. Processes and Plants in Operation
2. Recycling and Environmental Credit
3. Emissions Control

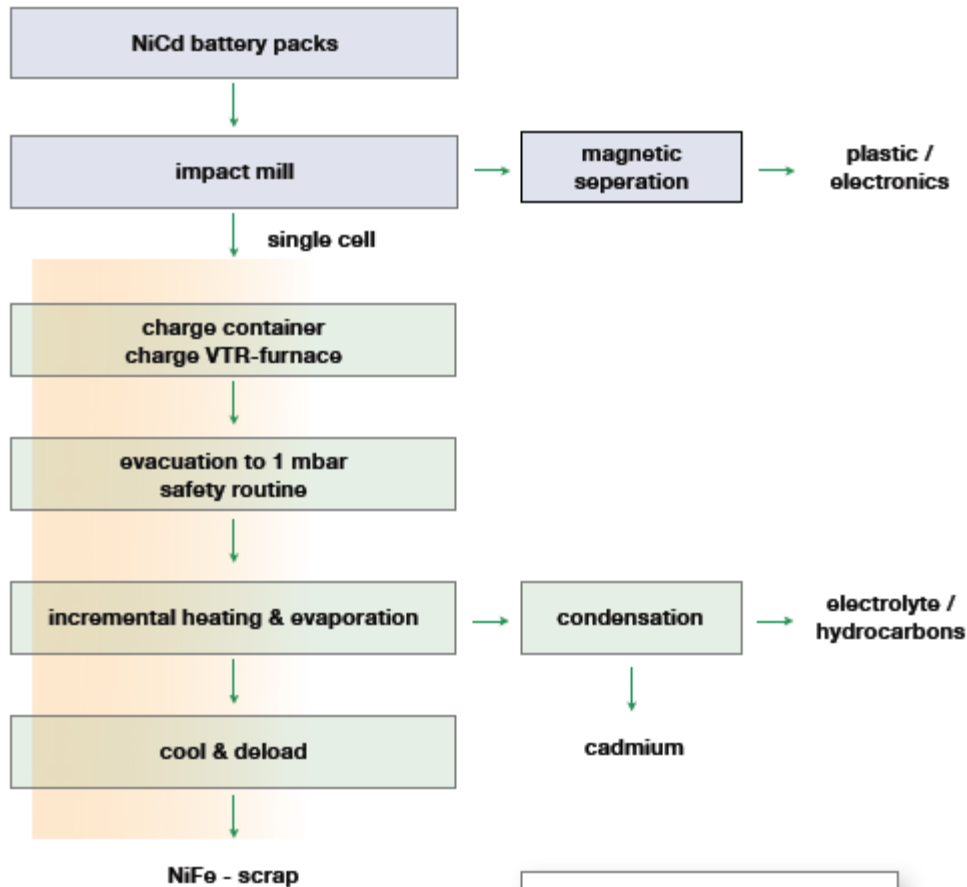
2. RECYCLING Ni-Cd BATTERIES

SNAM Process for Recycling NiCd and NiMH Batteries



ERM Report 2006

2. RECYCLING Ni-Cd BATTERIES



- process advantages:
- one step process
 - ultra low emission (< 0,01 g/h)
 - highly secure
 - energy efficient



ACCUREC®
RECYCLING GMBH

Recycling of NiCd-batteries

No emission risk by recycling:

Cd measured: $< 0,002 \text{ mg/m}^3$

Cd $< 10 \text{ g/year}$

for 2.000 tons of NiCd batteries recycled

No exposure risk by recycling:

Cd measured in the facility

$0,002 \text{ mg/m}^3$

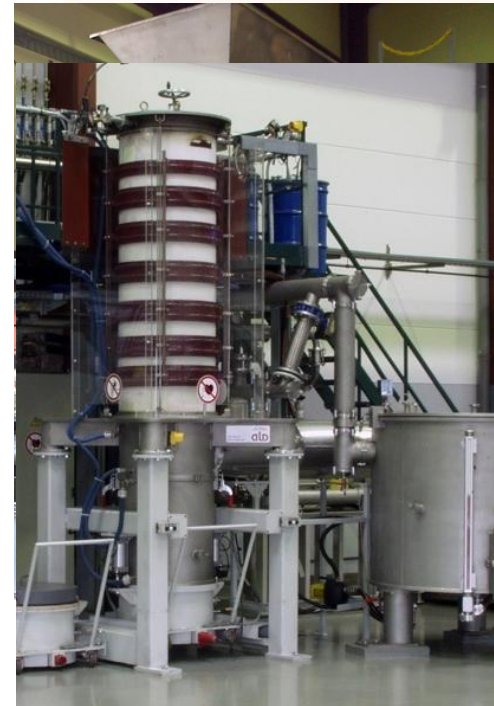
EU limit: $0,02 \text{ mg/m}^3$

No worker risk by recycling:

Cd measured in $\nearrow\text{g/g}$ Creatinine

$< 1,5 \nearrow\text{g/g}$

for workers joining NiCd plant > 5 years



Emissions of Cadmium to the Environment

DATA reported in the TRAR

**Table 3.1.10: Summary emission from recycling of NiCd batteries
(life cycle stage 4)**

Compartment	Total	Regional
	kg/y	kg/y
Air	1.77	1.77
Wastewater	0	0
Surface water	0.13	0.13
Soil, urban/	0	0
Total	1.9	1.9

A ban on Ni-Cd will impact the recycling activity:

- 1. Economic development of recycling technologies is currently supported by a profitable activity**
- 2. The return of batteries with a negative economic value and low recycling efficiency will be subject to alternative market forces that will question the current activity**
- 3. A 20 year recycling activity where the recovered metal is re-used in batteries production will disappear >>> resource efficiency ?**

Additional Economic Impacts

**€-Impact of landfilling collected batteries : eg. Monetary losses
Of the Nickel, Cobalt, Steel and Cadmium value?**

**€- Impact of recycling a battery at cost (Li-Ion) vs recycling
a battery with profit**

Cost of landfilling unused cadmium ?

Loss of Recycling Activity – shift to alternative processing facility

**...while Cadmium is recovered with 99 % Efficiency (+) and Re-used
In new batteries manufacture**

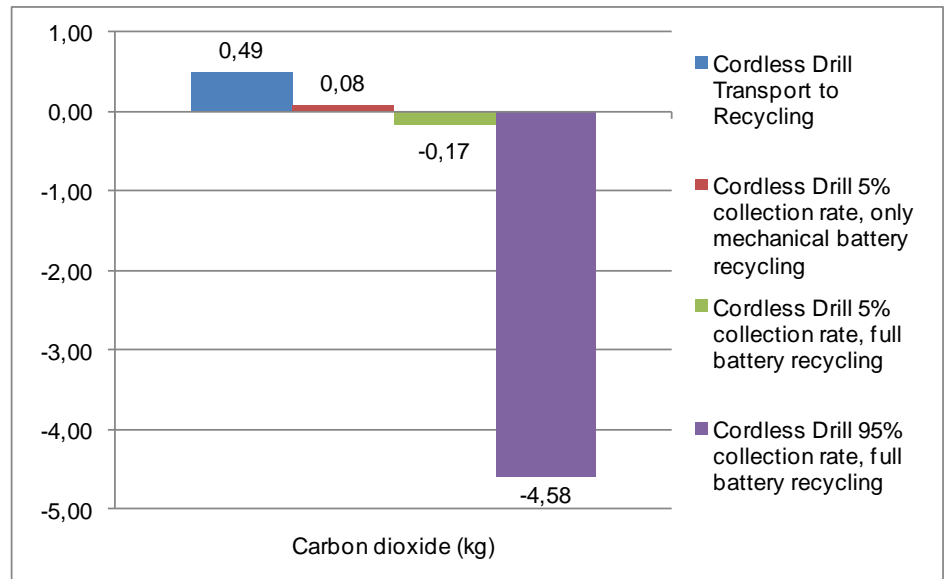
Scenario Analysis: Is it worth transporting to recycling?

Manufacture : 18.5 kg CO2 eq

Use Life : 45 kg CO2 eq.

**Transportation
EOL 1000 km : 0.49 kg CO2 eq**

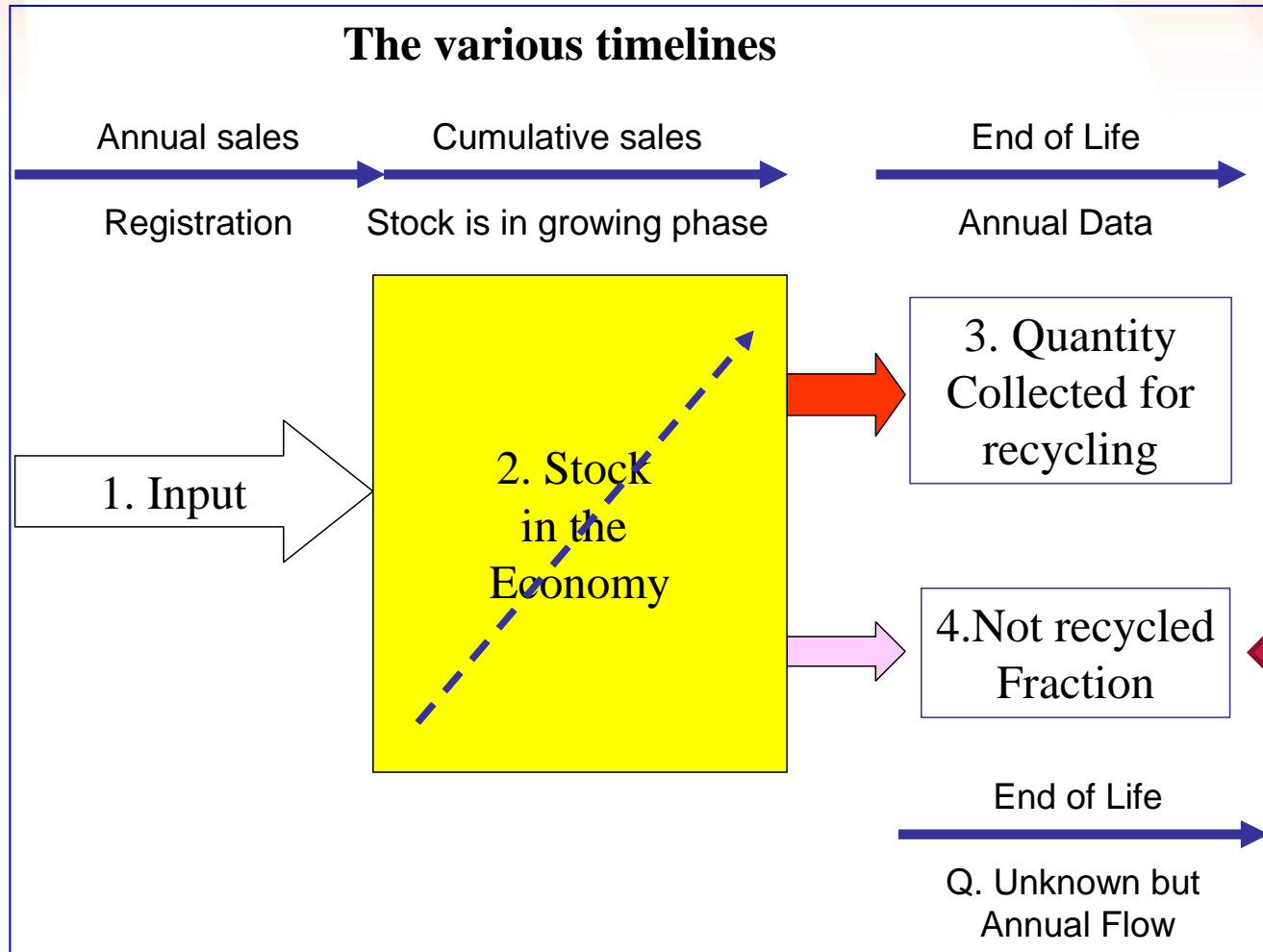
GWP [kg CO2-eq.]	
Mechanical parts	2,39
Stainless steel cold roll	0,99
ABS granulate	1,39
Electronic parts	16,12
Initial charging per cell	0,55
Battery cell components	15,57
Total Batteries (2*1070g)	18,50



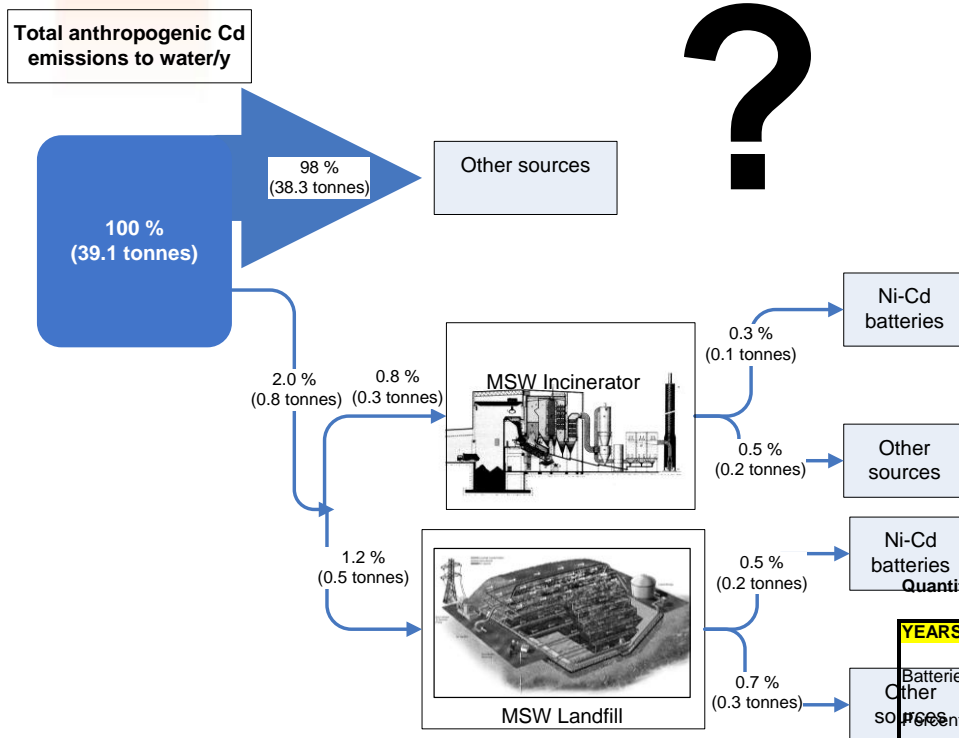
EPTA

RECHARGE

3. End of Life (Emissions)



3. End of Life (Emissions)



Case of The Netherlands

Quantity of Spent Batteries identified in HH waste stream in The Netherlands (Source STIBAT)

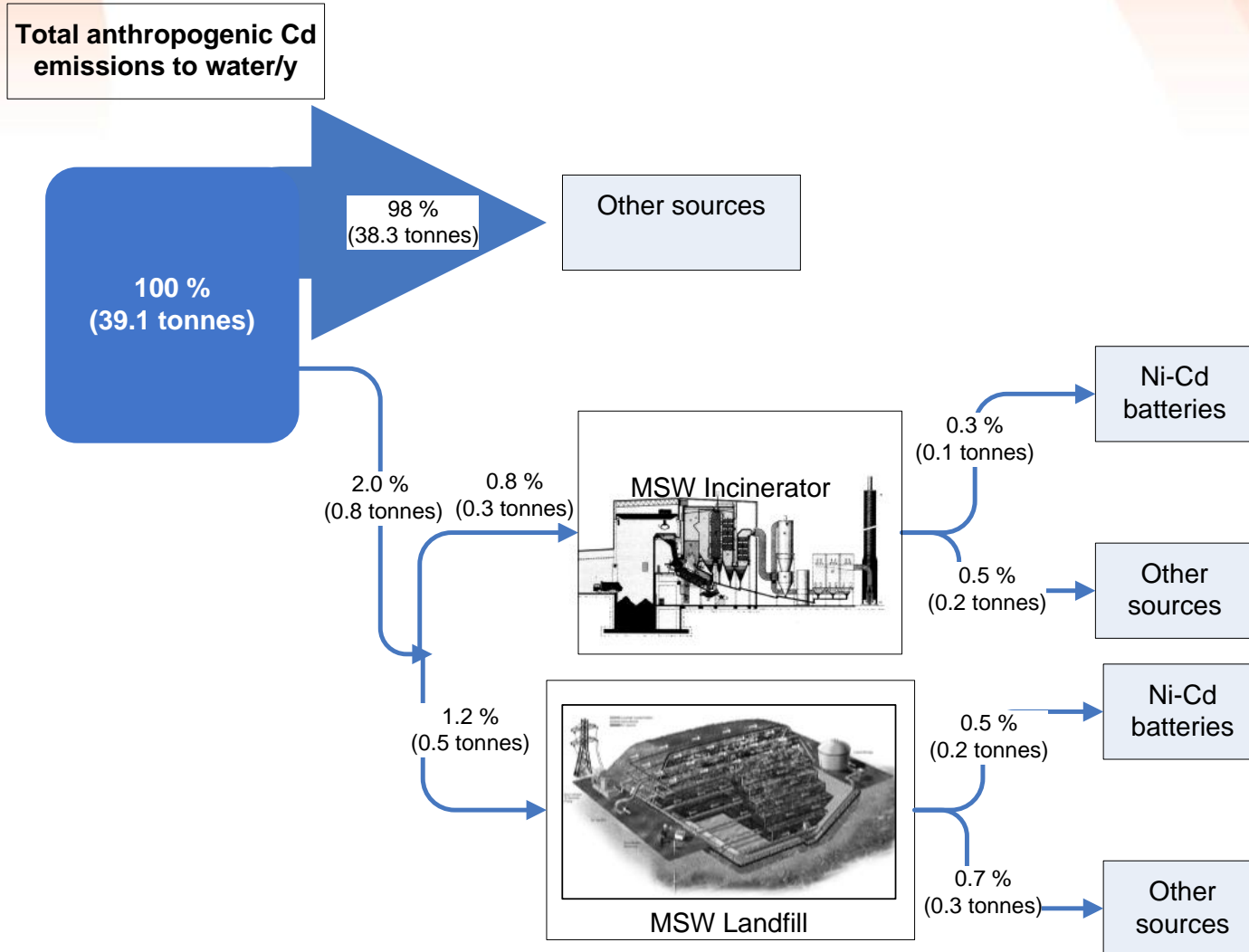
YEARS	2003	2004	2005	2006	2007
Batteries in MSW (Tonnes)	735	624	546	577	479
Other sources	7,5	8,1	7,1	7,4	NA
Tonnes Ni-Cd	55,125	50,544	38,766	42,698	NA
Yearly Sales (Tonnes)					
Tonnes Ni-Cd collected separately	165	214	178	147	178
Collection efficiency	75,0	81,1	82,0	77,4	NA

NB. Average annual quantity placed on the market = 600 Tonnes / year.

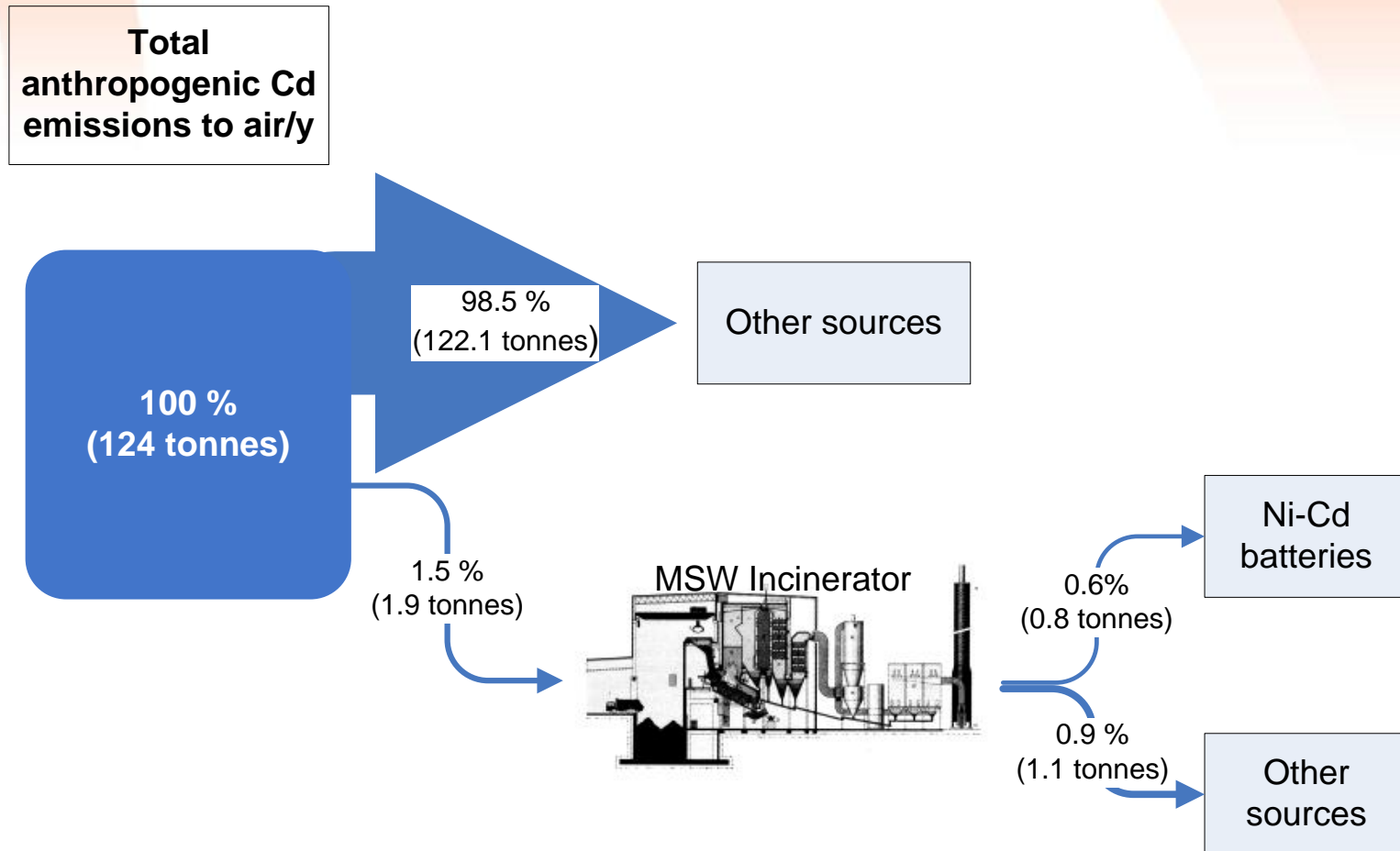
3. End of Life (Emissions)

1. In the TRAR, Cadmium emissions of the waste life cycle stage are benchmarked against the total cadmium emissions for the current situation (24.5 % incineration-75.5 % landfilling).
2. The total Cd emissions to water from all cadmium containing sources account to 39 tonnes Cd/y.
3. With regard to the water emissions, iron and steel production (40%) is one of the larger contributors together with the non-ferrous industry (24.9%) and the fertilizers (EURAS, 2005). The waste stage (landfilling and incineration) only contributes 2.0 % of total emissions.
4. Cadmium emissions to the air compartment account for 124 Tonnes Cd/y.
5. Oil and coal combustions (43.5%) and the iron and steel production (25%) are the largest cadmium emitters for the air compartment The contribution from MSW incinerators only contributes to 1.5 % of the overall cadmium air emissions..

3. End of Life (Emissions)



3. End of Life (Emissions)



Conclusions

If it is assumed that 40% of the emissions are due to Ni-Cd batteries a relative contribution of 0,8% to the water and 0.6% to the air cadmium emissions can be estimated. It can be concluded that the contribution of batteries to the overall anthropogenic metal emissions to air and water is limited compared to the other sources.

4. FINAL CONCLUSIONS

Today, the collection rate of Ni-Cd is much higher than alternative technologies.

More than 10 years collection data is available confirming this trend.

Nickel-Cadmium batteries are recycled with high efficiency, all the cadmium is recovered and can be re-used in batteries manufacture.

The TRAR confirmed that any future risk originated in long term emissions is a potential concern that can be managed by an efficient Collection of spent Ni-Cd batteries.

Waste Ni-Cd batteries represent a minor fraction of all sources of exposure of humans to cadmium via the environment.

The SCOEL does not recommend further measure on the use of cadmium in consumer products.

The current Batteries Directive is a suitable legislative tool to control the environmental impact of all types of batteries used in cordless power tools.