

European Commission (DG ENV)

COMPARATIVE LIFE-CYCLE ASSESSMENT OF NICKEL-CADMIUM (NiCd) BATTERIES USED IN CORDLESS POWER TOOLS (CPTs) VS. THEIR ALTERNATIVES NICKEL-METAL HYDRIDE (NiMH) AND LITHIUM-ION (Li-Ion) BATTERIES

July 18th, 2011 – Brussels

Sandeep Pahal

Policy Analysis

1

Current situation

2

Policy scenario analysis

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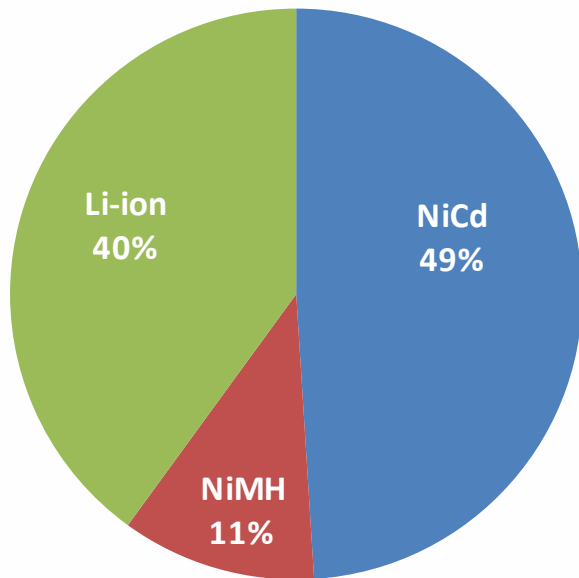
Next steps

Market of NiCd batteries used in CPTs

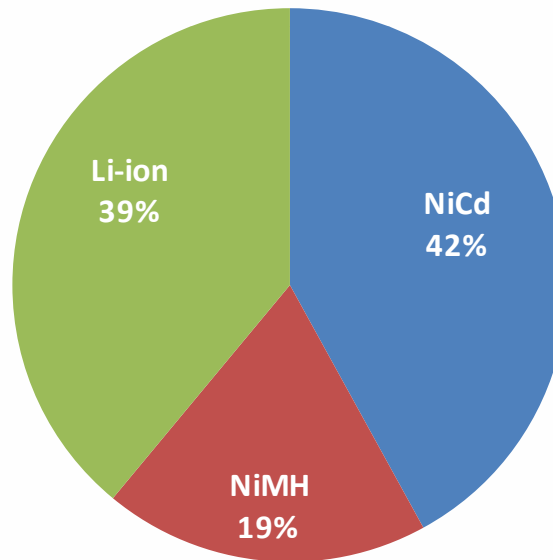
- CPTs represent 36% of the overall electric power tool market value (2007)
- EU has 47% of world market share of NiCd batteries used in CPTs (2008)
- The EU market value of the CPT sector was €1,440 million (2007)
- Number of NiCd cells used in CPTs was 240 million cells within the EU (2008)

Market share (*number of units*) of NiCd batteries used in CPTs (2008)

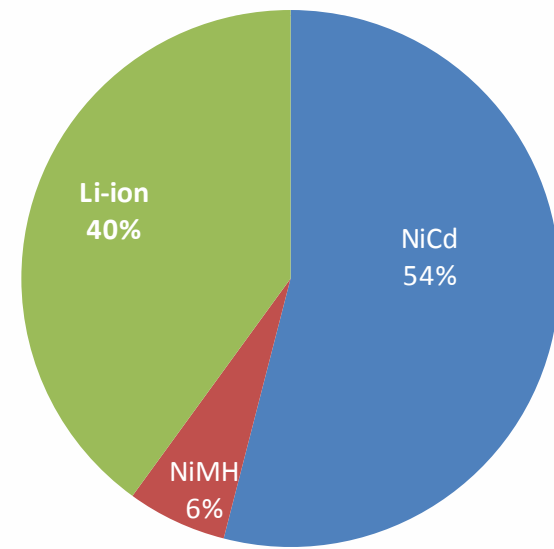
Overall market



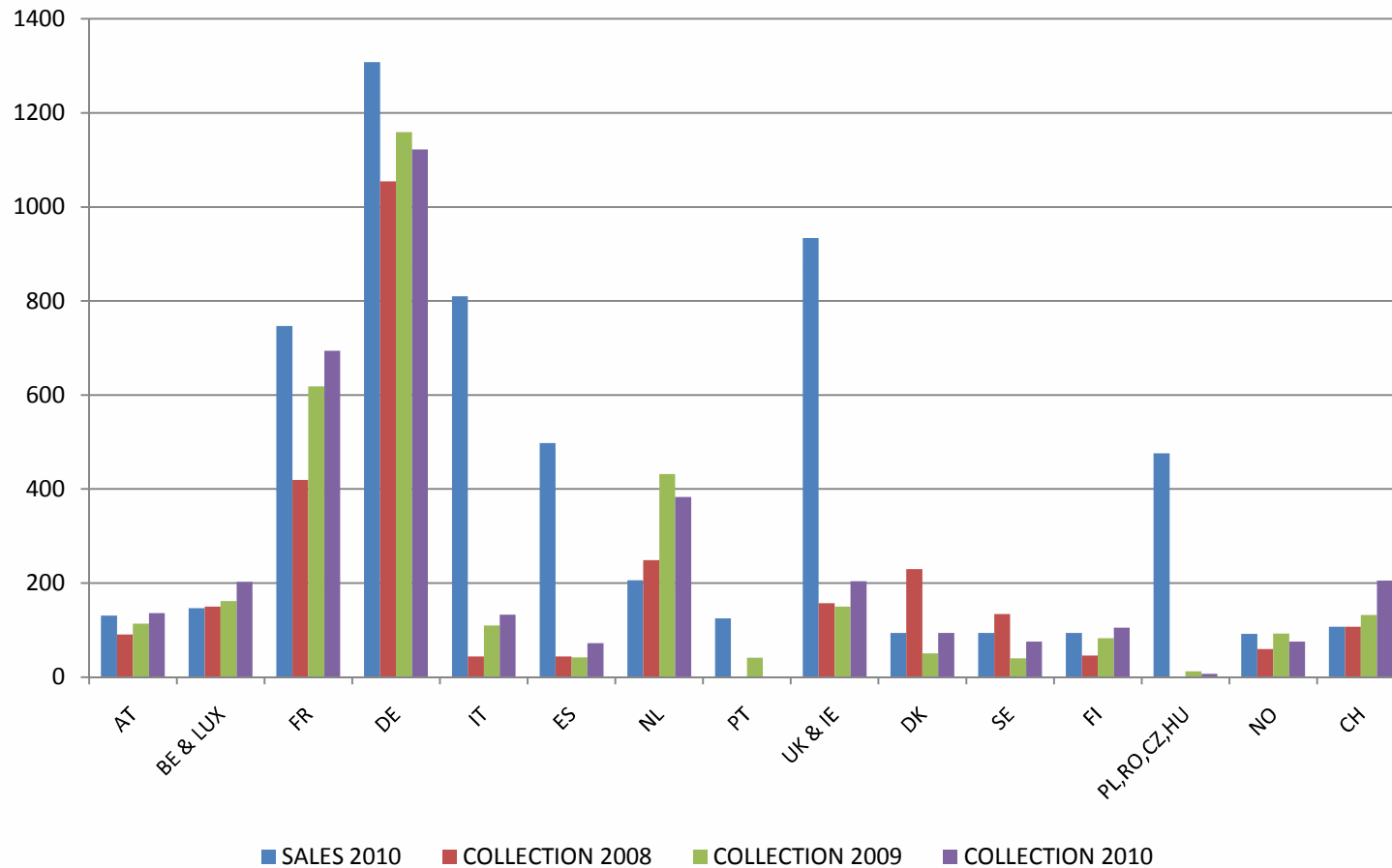
Professional (PRO) market



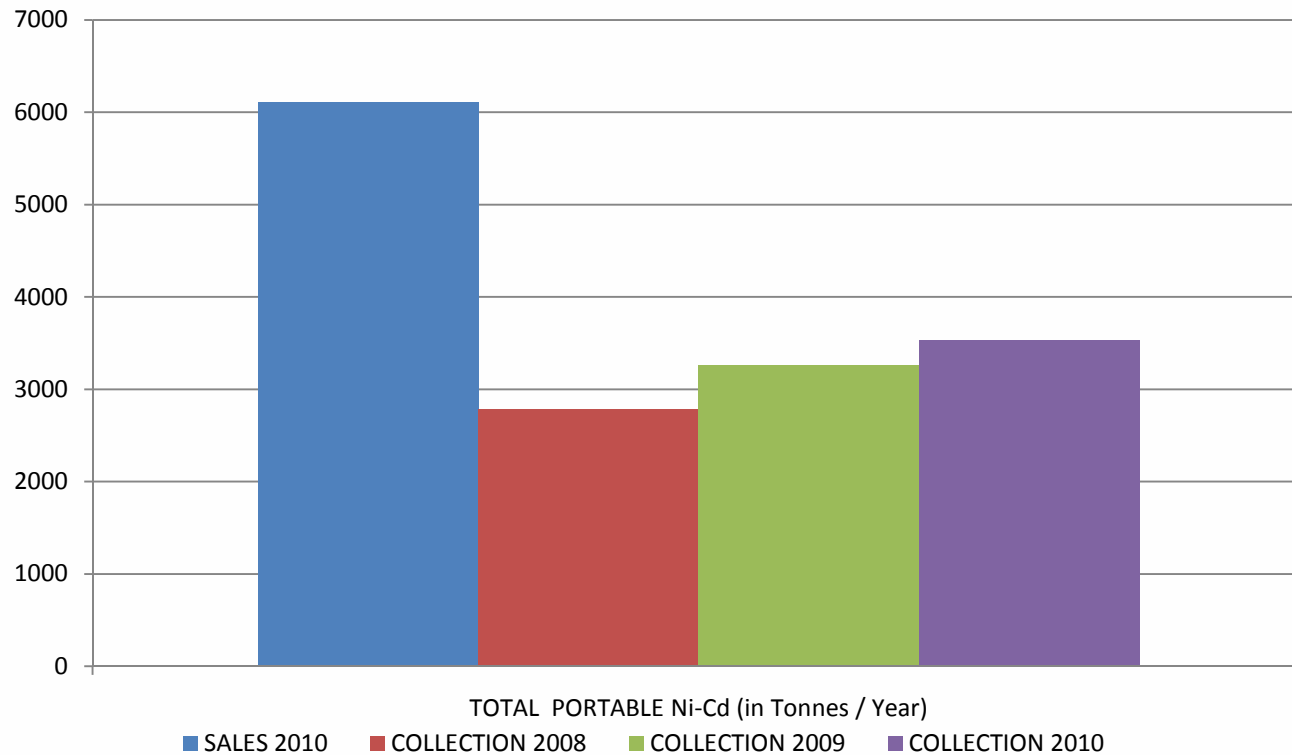
Do It Yourself (DIY) market



Comparison between **estimated sales** of portable Ni-Cd batteries (*CPT Application*) & **waste portable Ni-Cd collected** (in tonnes/year). *Data by Member State*
 (Source: RECHARGE)



Comparison between **estimated sales** of portable **Ni-Cd batteries** (*CPT Application*) & **waste portable Ni-Cd collected** (in tonnes/year). *Data: TOTAL EU 27 + NO + CH*
(Source: RECHARGE)



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Market Forecast assumptions (1/2)

- Battery sales (*number of units*)
 - CPTs market in EU is expected to grow annually by 5% between 2010 and 2020
 - Annual decrease in sales of 5% from 2008 till 2020 in NiCd batteries used in CPTs
 - Replacement rate of NiCd batteries (*market trends and stakeholder consultation*):
 - 80% by Li-ion batteries
 - 20% by NiMH batteries

- Same collection costs for all three battery types
 - NiCd battery lifetime: 6 years (*literature review and stakeholder consultation*)
 - Collection rate:
 - 2010 till 2012: 25%
 - 2013 till 2016: linear increase from 25% to 45%
 - 2016 onwards: 45%

Market Forecast assumptions (2/2)

- End of life management of waste CPT batteries
 - Recycling
 - Recycling rate: literature review
 - Recycling cost: literature review and stakeholder consultation

Battery type	Waste battery recycling profit or loss (€/kg)		Landfill cost (€/kg)
	Ni price: €20/kg	Ni price: €10/kg	
NiCd	0.5	-0.5	0.5
NiMH	8	4	0.5
Li-ion (without Li recovery)	-1	-1	0.5
Li-ion (with Li recovery)	-0.7	-0.7	

Key Stakeholders

- Mining companies
- Cells manufacturers
- Pack assemblers
- CPT manufacturers
- Retailers
- Professional and DIY users
- Recycling companies
- Member States

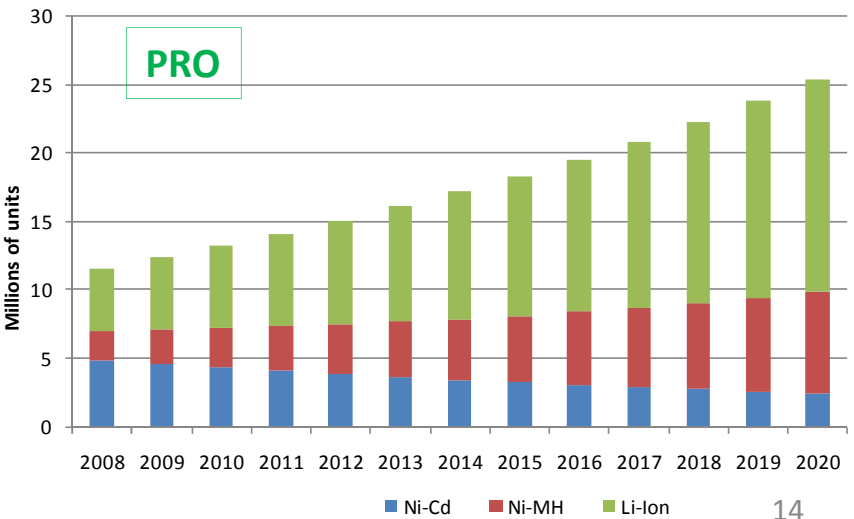
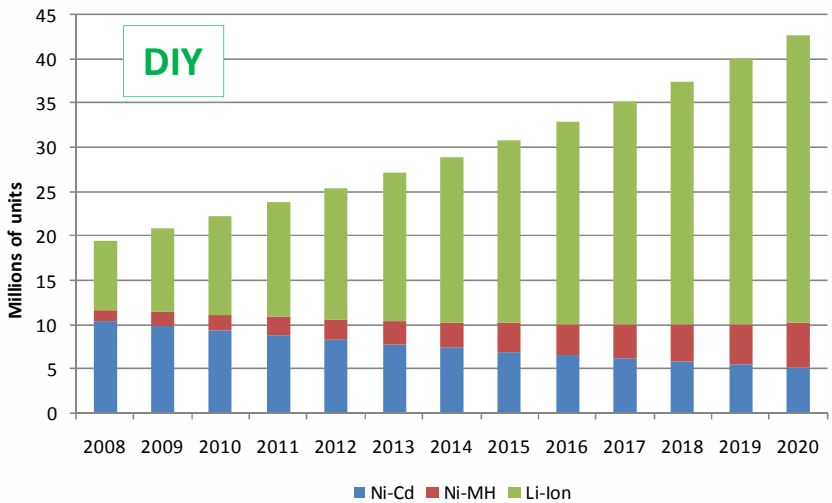
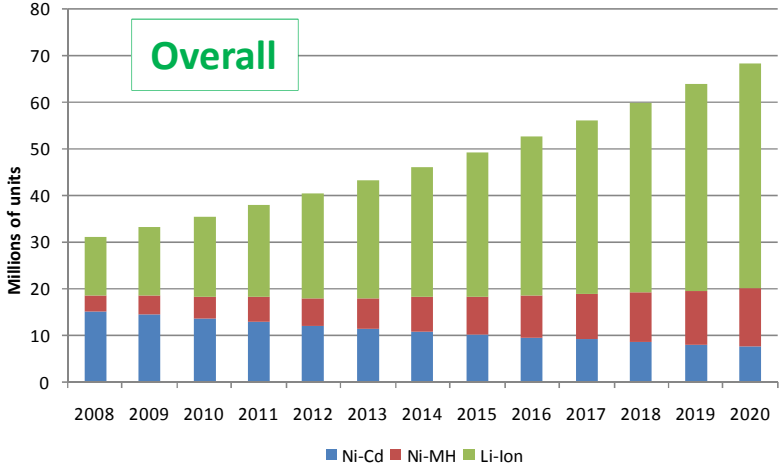
The policy options aim at addressing the current exemption to NiCd batteries for use in CPTs

- Option 1: Baseline scenario (no withdrawal of the exemption)
- Option 2: Immediate withdrawal of the exemption (2012/2013)
- Option 3: Delayed withdrawal of the exemption (2016)

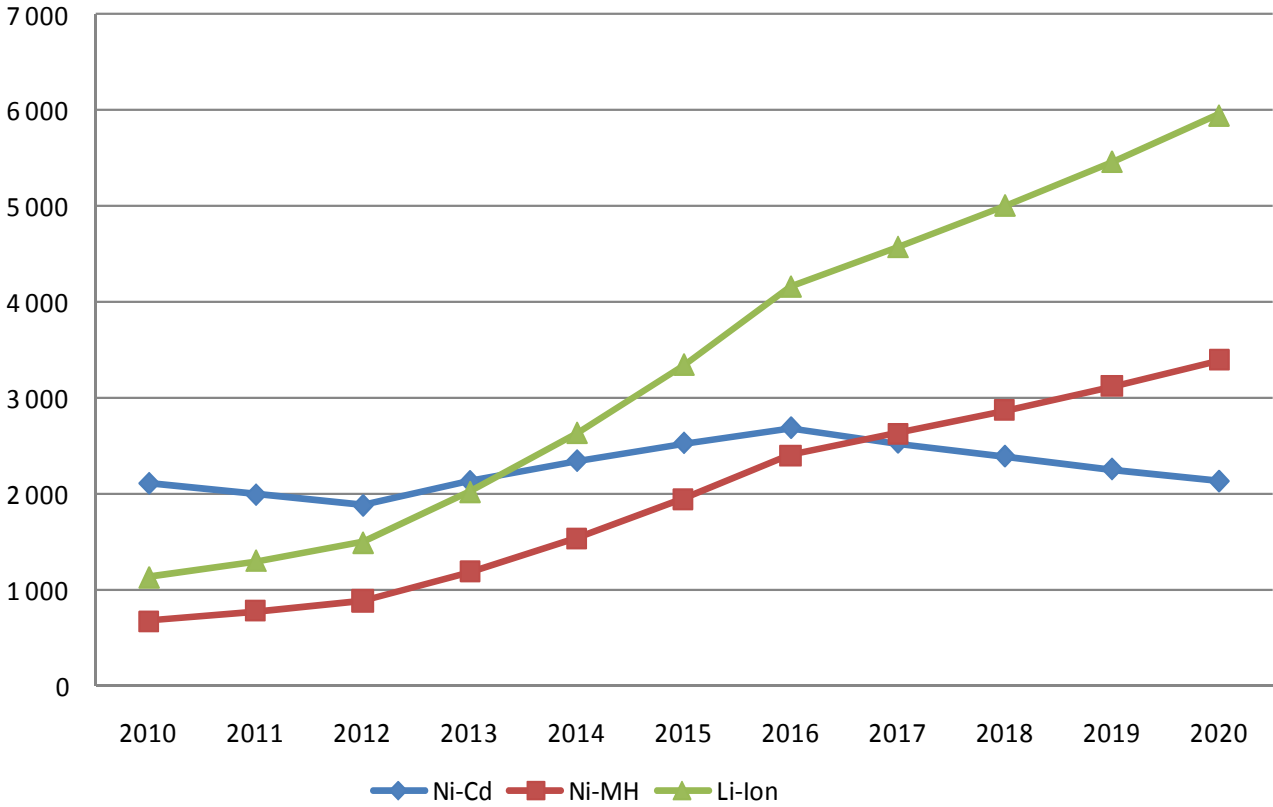
Option 1: Baseline scenario (no withdrawal of the exemption)

- No withdrawal of the current exemption in the Battery Directive (Article 4§3 (c)) to the use of NiCd batteries in CPTs
- Natural evolution of sales of NiCd and other alternative battery types used in CPTs
- NiCd batteries: annual decrease in sales of 5% from 2008 till 2020
- Replacement rate of NiCd batteries (market trends and stakeholder consultation):
 - 80% by Li-ion batteries
 - 20% by NiMH batteries
- Collection rate would continue based on current Battery Directive

Forecast of EU market, 2008-2020 (number of battery packs)

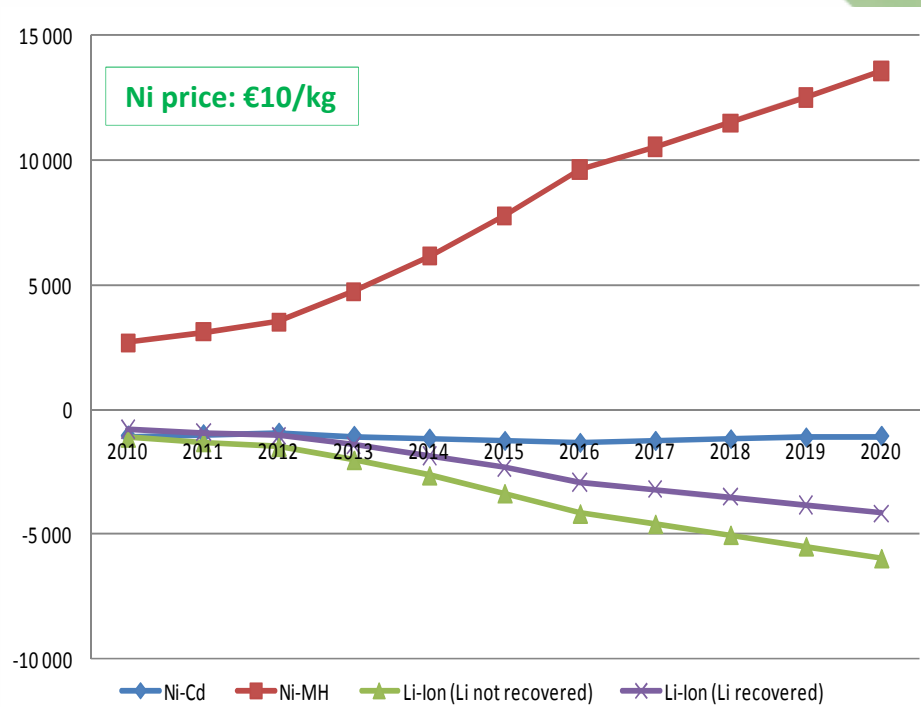
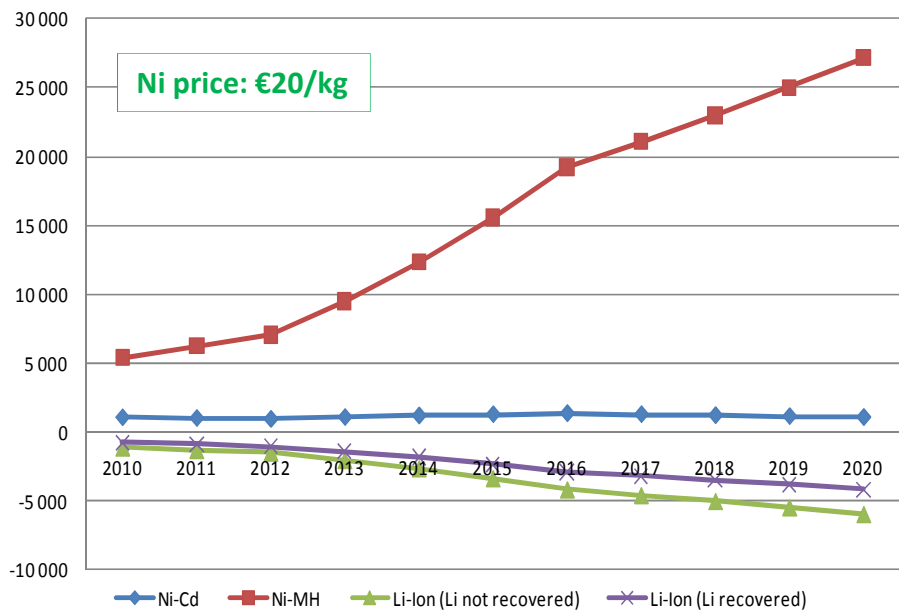


Evolution of waste CPT battery collection (in tonnes) in EU, 2010-2020

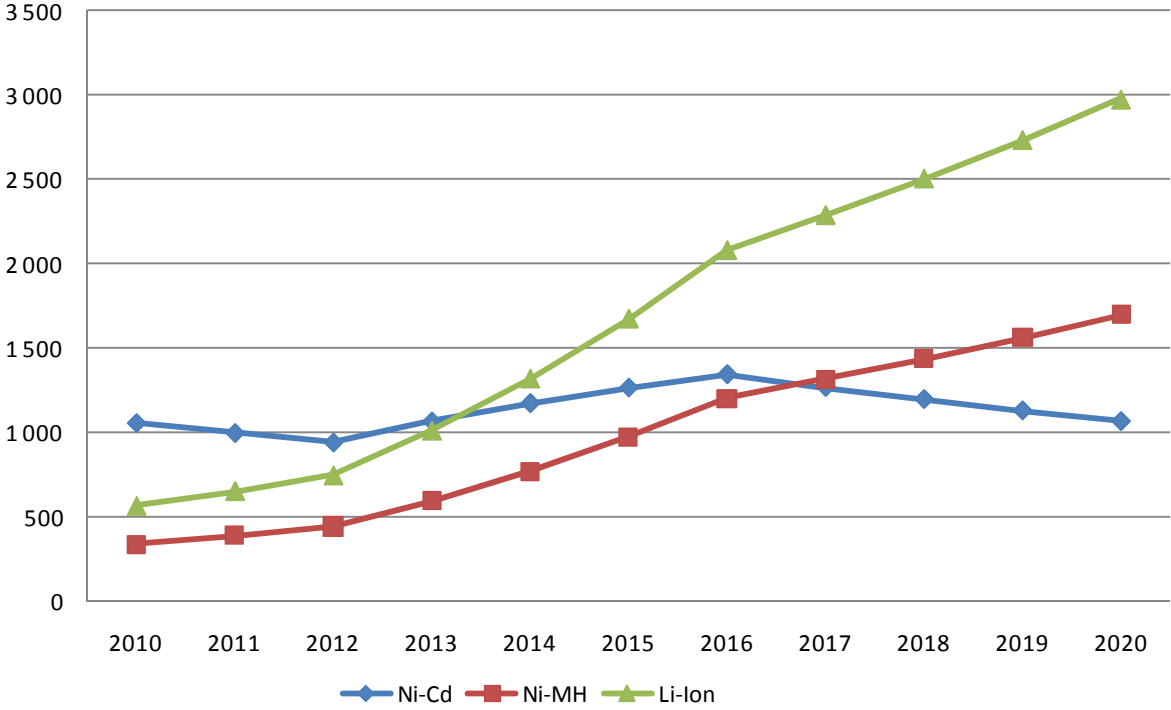


Year	Collection rate
Till 2012	25%
2012-2016	Linear increase from 25% to 45%
2016 onwards	45%

Forecast of profit or loss (in k€) of recycling waste CPT batteries in EU for 2010-2020



Forecast of landfilling cost (in k€) of waste CPT batteries in EU for 2010-2020



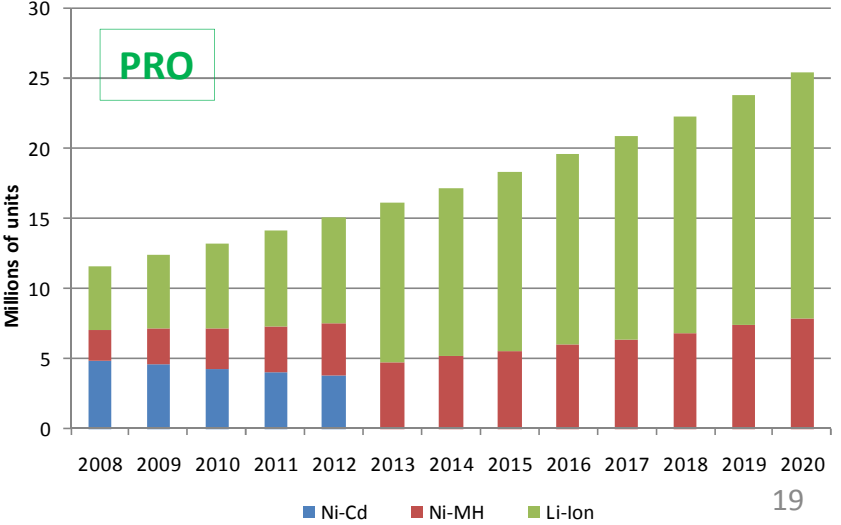
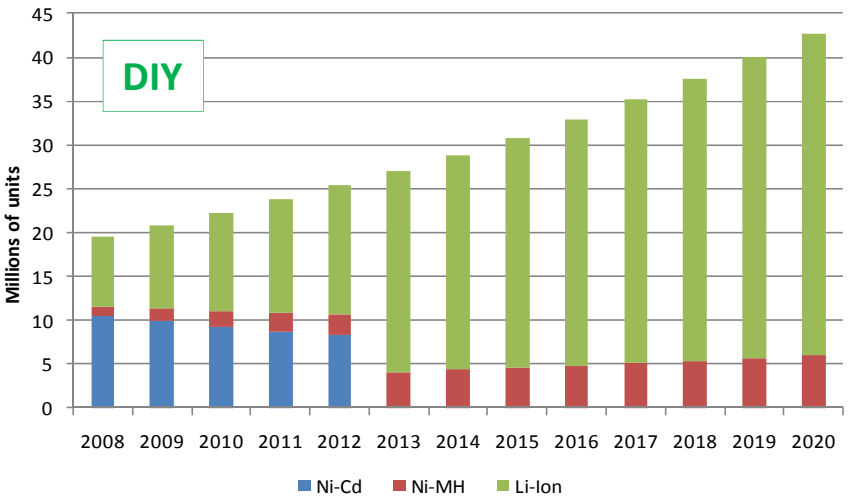
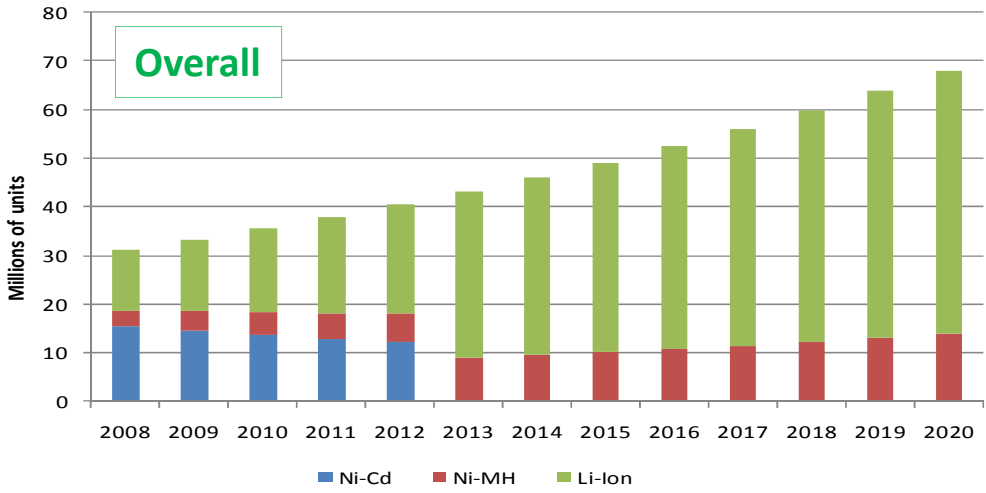
Battery type	NPV* in 2010 (k€)
NiCd	9 882 €
NiMH	8 025 €
Li-ion	13 870 €
Total	31 777 €

*NPV: Net Present Value with a discount rate of 4%

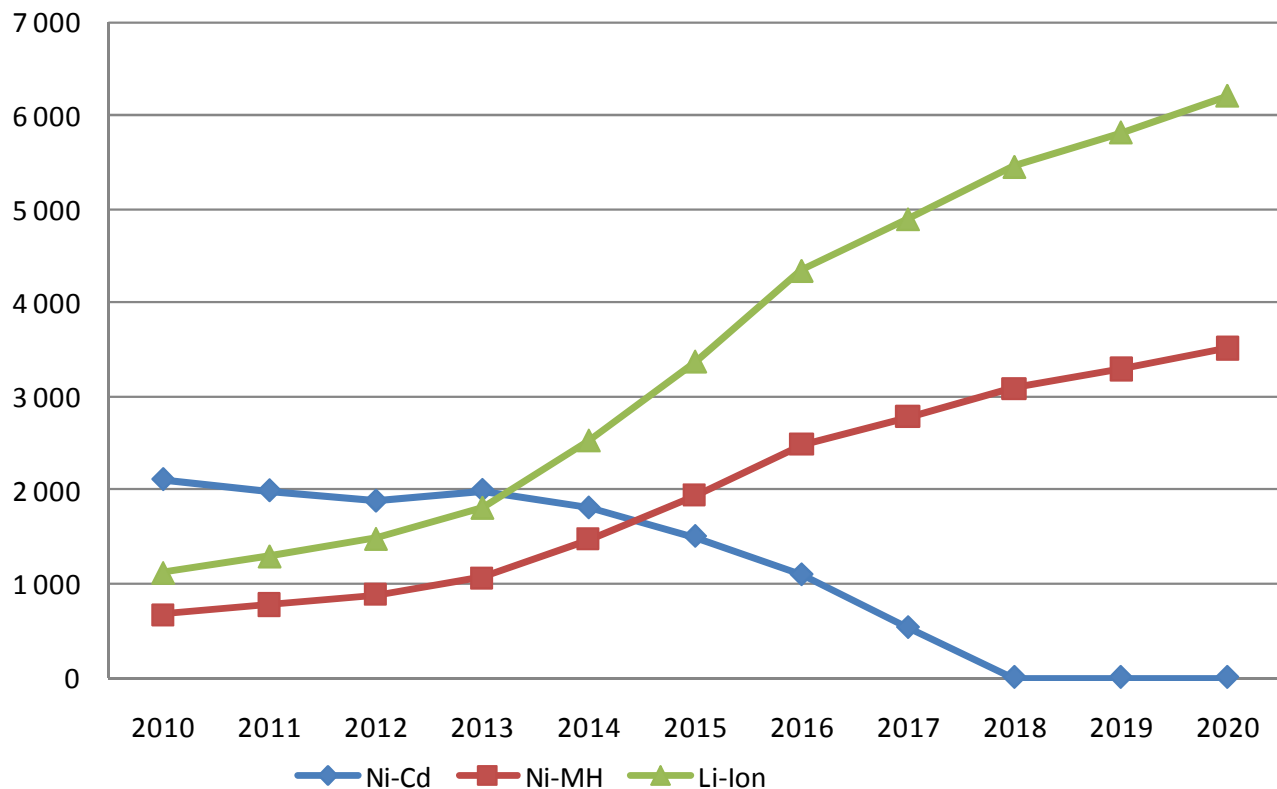
Option 2: Immediate withdrawal of the exemption (2012/2013)

- Immediate withdrawal of the exemption, banning the use of NiCd batteries in CPTs by **late 2012 or early 2013**
- NiCd batteries: annual decrease in sales of 5% from 2008 till 2012
- Replacement rate of NiCd batteries (market trends and stakeholder consultation):
 - 80% by Li-ion batteries
 - 20% by NiMH batteries
- Collection rate would continue based on current Battery Directive

Forecast of EU market, 2008-2020 (number of battery packs)

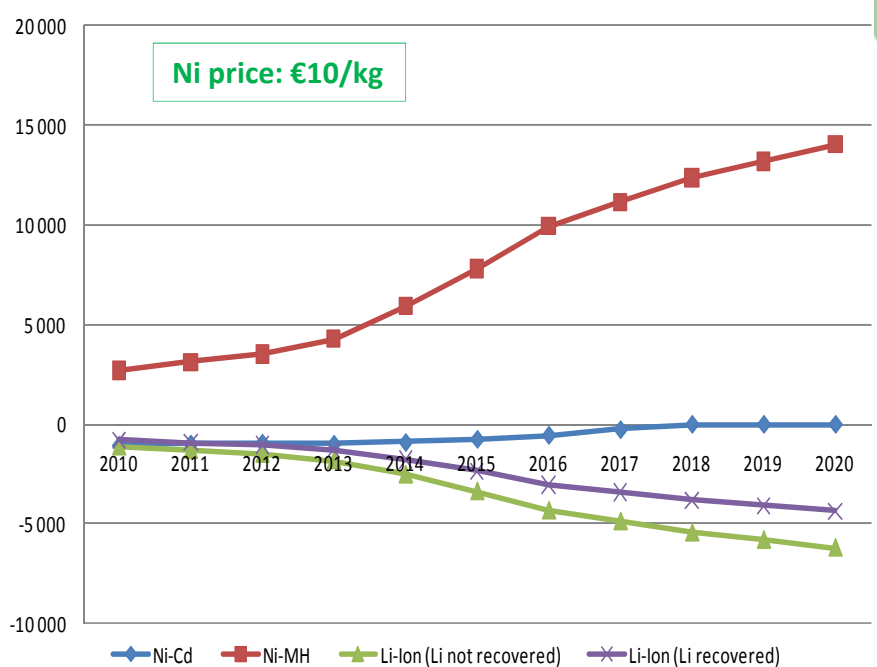
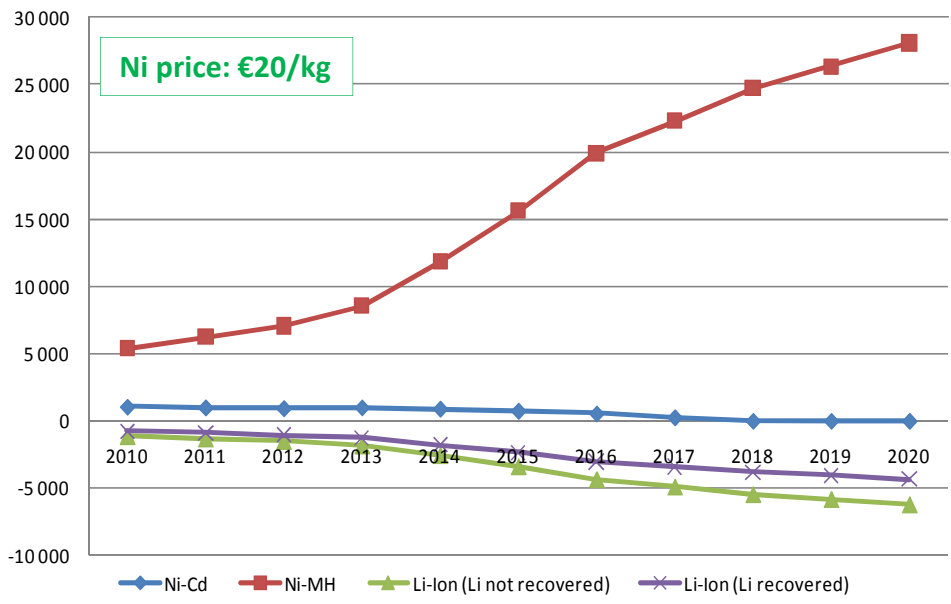


Evolution of waste CPT battery collection (in tonnes) in EU, 2010-2020

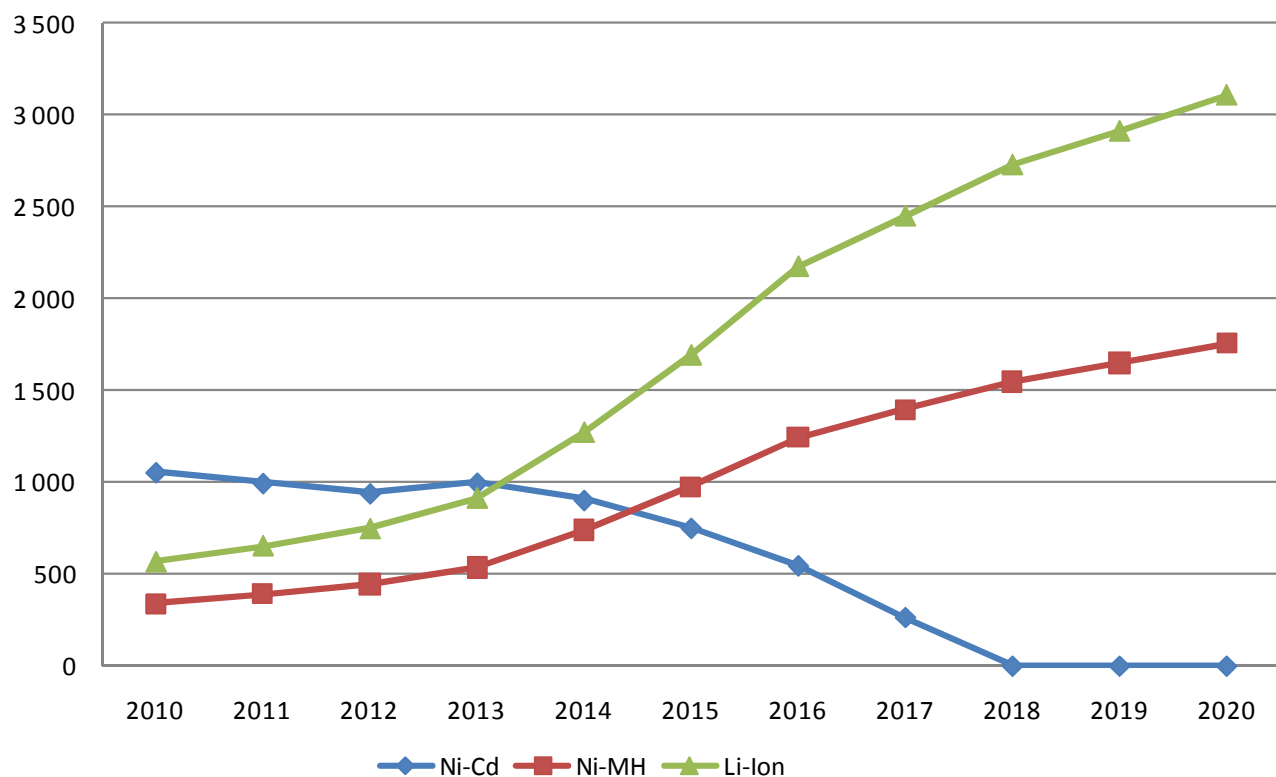


Year	Collection rate
Till 2012	25%
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2016 onwards	45%

Forecast of profit or loss (in k€) of recycling waste CPT batteries in EU for 2010-2020



Forecast of landfilling cost (in k€) of waste CPT batteries in EU for 2010-2020

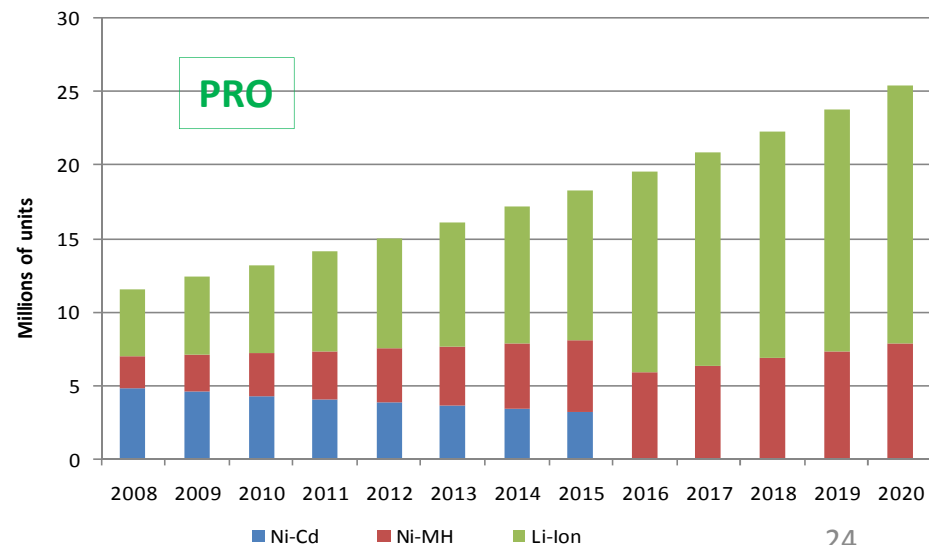
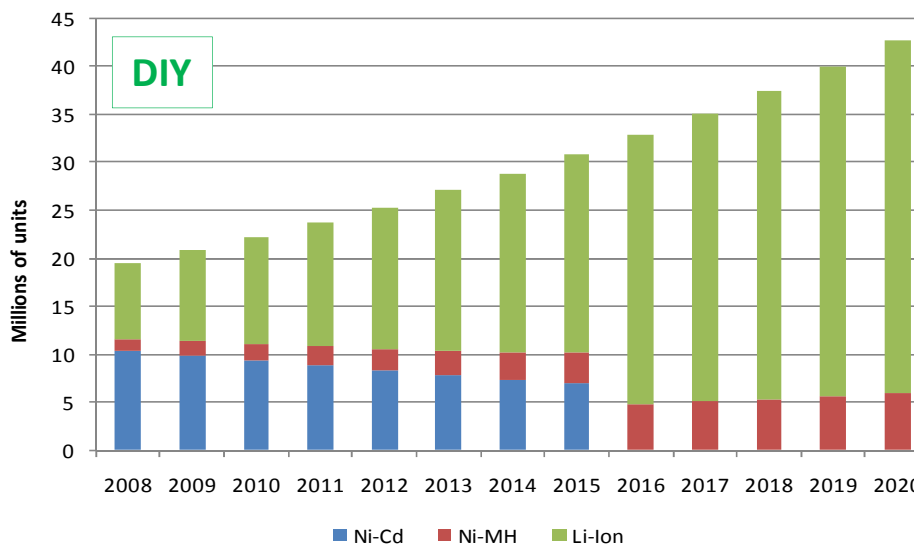
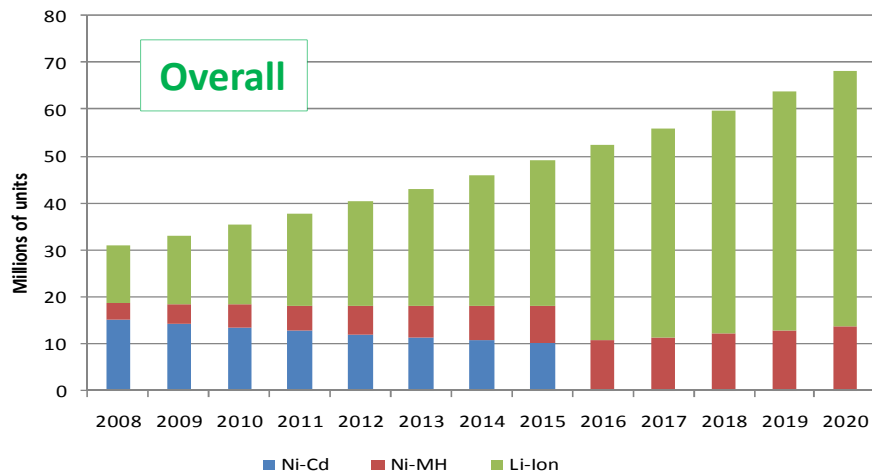


Battery type	NPV in 2010 (k€)
NiCd	5 569 €
NiMH	8 213 €
Li-ion	14 295 €
Total	28 077 €

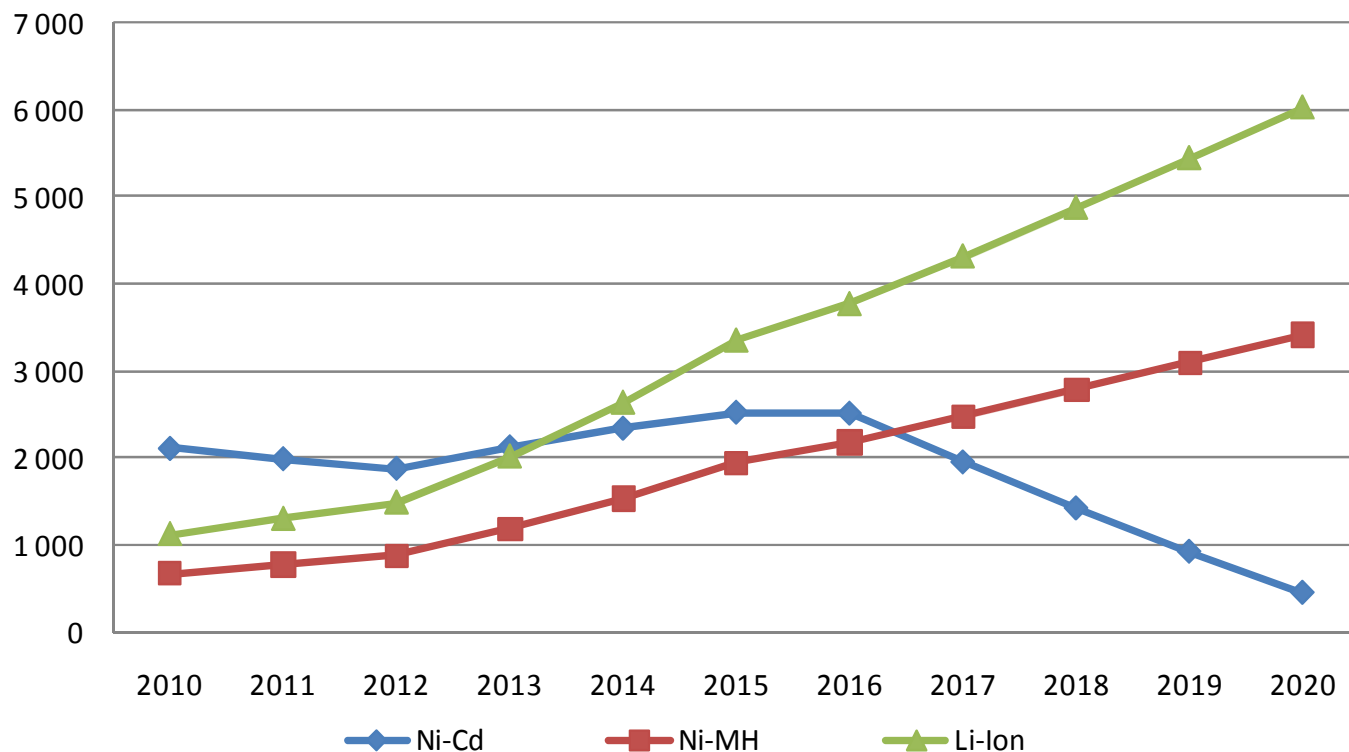
Option 3: Delayed withdrawal of the exemption (2016)

- Withdraw the exemption in force in **2016** thus banning the use of NiCd batteries in CPTs
- Allows the industry the time to adapt their facilities for production and treatment of non-NiCd batteries in the context of CPTs
- NiCd batteries: annual decrease in sales of 5% from 2008 till 2015
- Replacement rate of NiCd batteries (market trends and stakeholder consultation):
 - 80% by Li-ion batteries
 - 20% by NiMH batteries
- Collection rate would continue based on current Battery Directive

Forecast of EU market, 2008-2020 (number of battery packs)

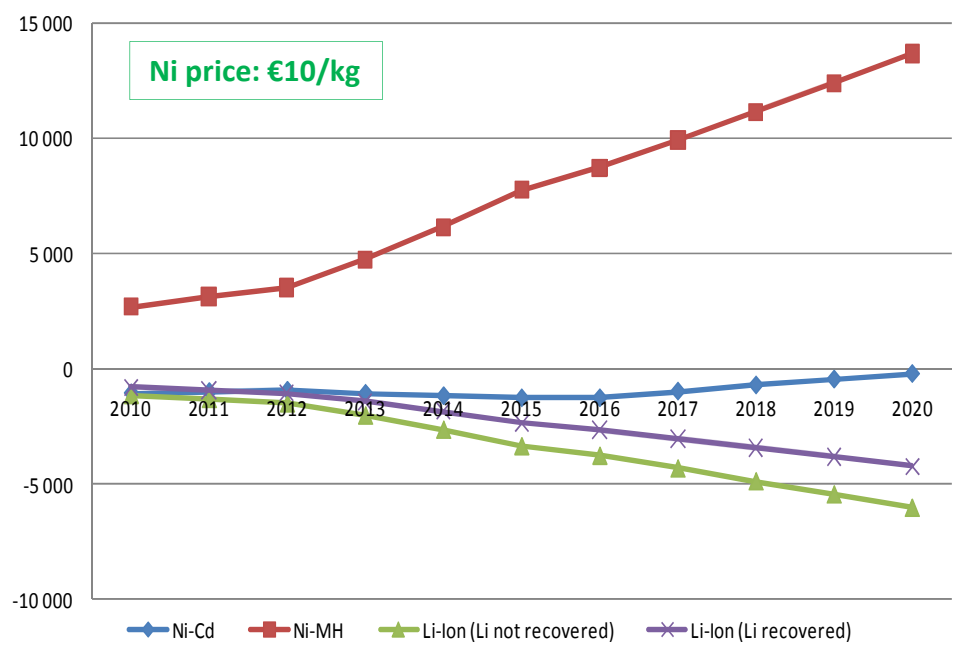
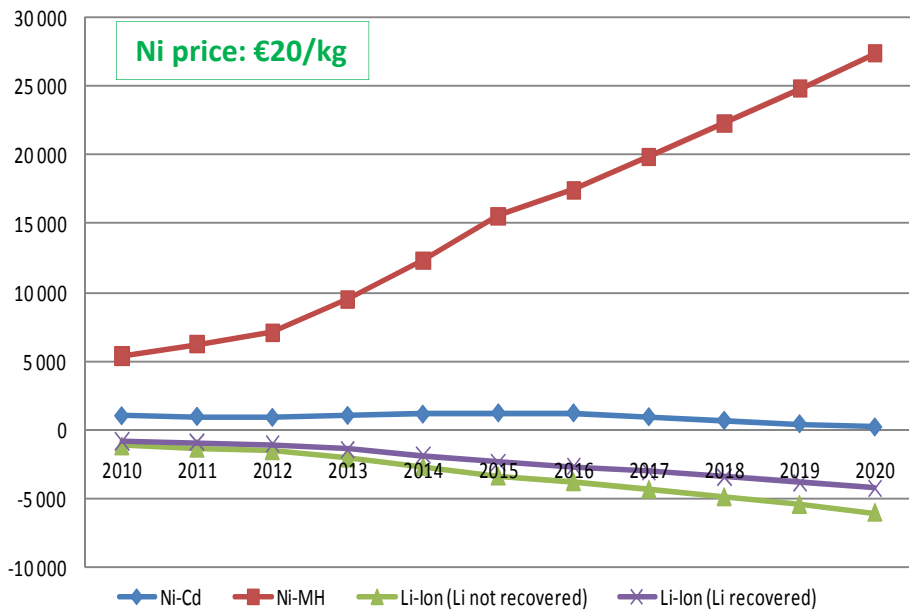


Evolution of waste CPT battery collection (in tonnes) in EU, 2010-2020

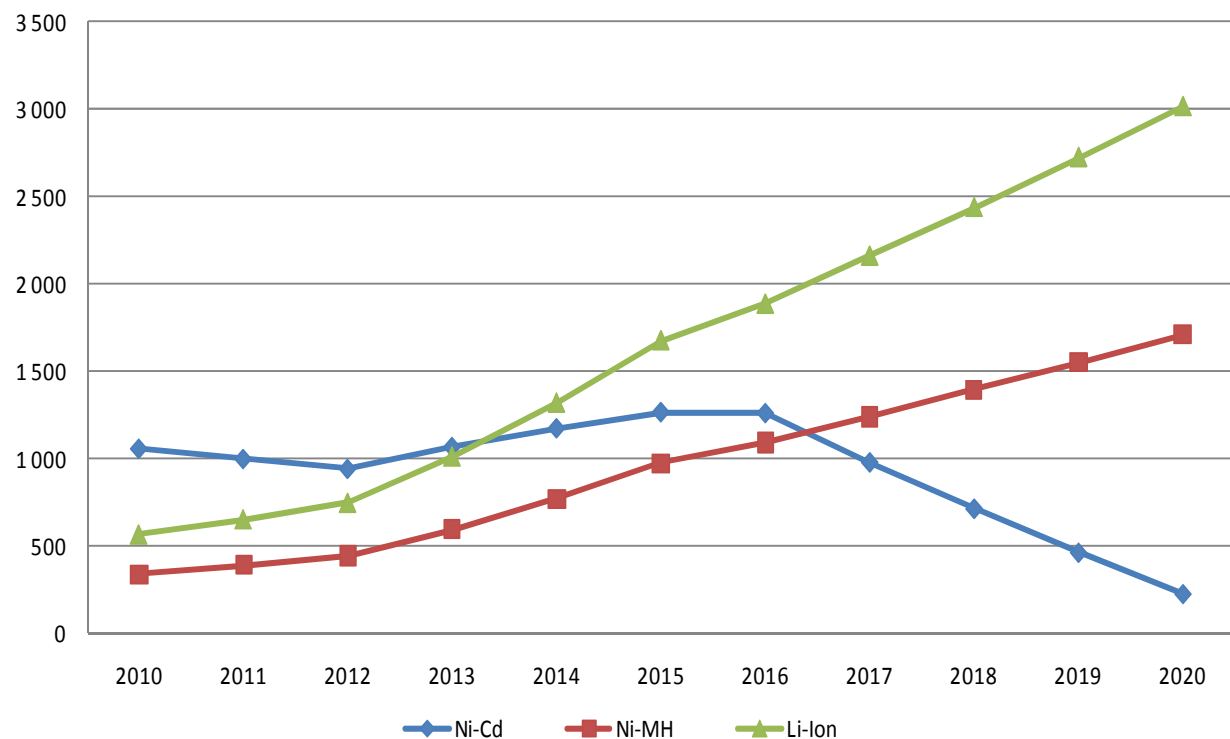


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2016 onwards	45%

Forecast of profit or loss (in k€) of recycling waste CPT batteries in EU for 2010-2020



Forecast of landfilling cost (in k€) of waste CPT batteries in EU for 2010-2020



Battery type	NPV in 2010 (k€)
NiCd	8267
NiMH	7854
Li-ion	13593
Total	29713

Preliminary findings (1/2)

- **NiCd battery** technology represents the **leading share** of the overall CPT market in EU
- NiCd battery waste **collection rate** varies significantly across Member States
- **Collected weight** of NiCd batteries in EU + NO + CH increased by 27% between 2008 - 2010
- For the period, 2010-2020:
 - **BaU scenario:** about 18,000 tonnes of **Cadmium will be introduced in the EU** market via NiCd batteries used in CPTs
 - As compared to BaU, « Option 2 » and « Option 3 » will lead to 66% and 38% **lower placing of Cadmium in the EU** market (via batteries used in CPTs) respectively

Preliminary findings (2/2)

For the period, 2010 - 2020:

- **Landfill costs:** « Option 2 » represents least NPV in 2010, 12% and 6% lower than that of « BaU » and « Option 3 » respectively

- **Waste CPT battery recycling (Ni price of €10/kg):** « Option 2 » represents highest NPV in 2010:
 - With Li recovery: 19% and 15% higher than BaU and « option 3 » respectively
 - Without Li recovery: 15% and 13% higher than BaU and « option 3 » respectively

- **Waste CPT battery recycling (Ni price of €20/kg):** « BaU » represents highest NPV in 2010:
 - With Li recovery: 2% and 4% higher than « option 2 » and « option 3 » respectively
 - Without Li recovery: 2% and 3% higher than « option 2 » and « option 3 » respectively

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Next steps

Impact analysis (work in progress)

- Selection of impact categories and indicators
 - Environmental impacts (based on LCA results)
 - Economic impacts (on consumers, on industry, waste management costs, etc.)
 - Social impacts (job losses, job creation, etc.)
 - Administrative impacts (implementation and enforcement costs for Member States)

- Analysis of impacts

Comparison of the three policy options (work in progress)

- Comparison of the three policy options based on:
 - Magnitude of impacts
 - Cost-effectiveness
- Identification of indicators to evaluate the progress in implementation of the policy options
- Recommendations

Time schedule



Thank you for your attention!

Sandeep Pahal

sandeep.pahal@biois.com

Shailendra Mudgal

shailendra.mudgal@biois.com

Benoit Tinetti

benoit.tinetti@biois.com