

Introduction

- “the initiative will modify the Directive or a proposal for a new Regulation repealing the Directive will be prepared, to notably encompass end-of-life and sustainability requirements. (... Q4 2020)” 2020 CWP
- Information from
 - Studies and consultation underpinning the assessment and evaluation of the Directive,
 - Studies and consultation carried out in the context of the ‘eco-design’ process,
 - Extensive consultation processes during and following up to the Strategic Action Plan on Batteries,
 - Two specific studies,
 - *Feasibility of measures addressing shortcomings in the current EU batteries framework system,*
 - *Study addressing particular topics on batteries (legal statuses, restrictions, etc).*

Proposed approaches and measures

- Taken from
 - EU institutions
 - Stakeholders' proposals
 - Technical and scientific publications
- Disclaimer

This document is part of a study which is being prepared for the European Commission. However, the information and views set out in this report are those of the authors and do not necessarily reflect the official opinion of the Commission. The Commission does not guarantee the accuracy of the data included in this initial presentation of results.

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Batteries Directive 2006/66/EC

Initial results of the study in support of the assessment of the Batteries Directive

Measure 1 - Higher collection target for portable batteries



COLLECTION

Measure 1

**Higher collection target for portable
batteries**

COLLECTION

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Measure 1 – Higher collection target for portable batteries (I)

Problem description

- Insufficient collection of portable batteries is a major shortcoming. Improving and increasing collection need to be one of the priorities of the new regulatory framework on batteries.
- The current target for collecting waste portable batteries (45% collection target) does not promote a high level of collection.
- 45% collection means that more than half of total portable batteries are “lost”
 - batteries accumulate over many years in landfills or somewhere else
 - lost batteries may present a steadily growing risk to the environment
- The collection target does not minimise the battery disposal as mixed municipal waste (there are no reporting obligations related to batteries ending-up in municipal waste).
- The high rate of non-compliance for this target is concerning since it increases the risk of pollution by hazardous components of waste batteries.
- Losses of portable batteries also prevent the achievement of other objectives (such as supporting a circular economy and attaining a high level of material recovery).

Measure 1 – Higher collection target for portable batteries (IIa)

General approach and main assumptions

- The focus of this measure is on higher amounts of collected portable batteries but not on the calculation methodology of the collection rate.
- However, the calculation methodology of the collection rate is considered separately at the end of this measure/presentation.
- The alternative options are compared to the current situation (baseline). Thus the collection rate is based on PoM. Should any other methodology (e.g. ‘available for collection’) be applied, the same amount of collected portable batteries would have to result.
- The measure does also not consider how more waste portable batteries can be collected. Therefore, implementation (information campaigns, deposit system, curbside collection, removability, etc.) is assessed in separate measures.
- Thus, this measure ‘Higher collection target of portable batteries’ only assesses the impact of higher collection and assumes that the new collection target is achieved.
- The measure does not consider potential changes of the categories industrial / portable batteries. In case industrial batteries would be re-allocated to portable, additional amounts of waste batteries would have to be collected.

Measure 1 – Higher collection target for portable batteries (IIb)

General approach and main assumptions

- “Losses” (higher collection can be achieved by avoiding these losses):
 - Batteries disposed of in municipal waste;
 - Hoarding of batteries by the end consumer (longer life time of batteries or more batteries are accumulated, e.g. increase of electric appliances with batteries incorporated);
 - Littering;
 - Losses through WEEE (batteries are not removed from WEEE and are instead shredded together with the appliances); and
 - Export (outside the EU; example of West Africa) of used EEE with their batteries still incorporated.
- Higher collection can be achieved by avoiding losses of batteries being disposed of in municipal waste: for simplification and better understanding of the effects exclusively alkaline batteries are considered for this case. (In practice, a higher share of button cells are expected.)
- Higher collection can be achieved by avoiding losses through WEEE and exports: for simplification and better understanding of the effects only Li-ion batteries (Li-ion batteries plus alkaline for achieving 75% collection) are considered for this case.

Measure 1 – Higher collection target for portable batteries (IIb)

General approach and main assumptions

- Results of the impacts represent the difference between baseline and option.
- EU totals are always calculated and presented.
- Simplification regarding presentation of the results:
 - the results of the measure (higher collection) show “immediately” in the year when the new target applies; in practice the collection rate is expected to increase successively.
 - results of the measure show for the years 2025 to 2035 (in practice e.g.: 55% 2025 → 65% 2030 → 75% 2035).
- Negative emissions = net-reduction / benefits / credits; they result when secondary materials resulting from recycling replace primary production
- Assumptions on the share of individual battery types in the collected batteries and battery losses are based on own expert judgement. No concrete data is available and, in addition, the share of the individual battery types in PoM changes over the years.

Measure 1 – Higher collection target for portable batteries (IIIa)

Alternative options

Baseline

- Current situation with a collection target of 45% for portable batteries.
- Large amounts of waste portable batteries in municipal waste (2015): ca. 35 000 tonnes, which corresponds to 27 % of all losses, 41 % of the amount of collected waste batteries and 16 % of the amount of placed on the market in 2015. (Evaluation study)
- In some MS waste industrial Pb-acid batteries are (misleadingly) reported under the category portable batteries → reported collection rates are too high
- Portable batteries are not being reported as PoM because of not registered producers (e.g. online sales) → reported collection rates are too high
- Only about half of all MS reach the 45% collection target.
- Overall, about 45% waste portable batteries are collected in the EU.

Measure 1 – Higher collection target for portable batteries (IIIb)

Alternative options

Option 1: 55% collection target for portable batteries

- The target of the collection rate of portable batteries needs to be significantly higher in order to ensure that environmental risks are reduced/avoided.
- New collection rate (current methodology): 55% in 2025
- For monitoring the success of higher collection rates obligatory waste analysis in all MS shall be established.
- Systematic waste analyses, e.g. every 3 years, shall be executed in every MS to monitor the amount of batteries in municipal waste (waste analyses would also be of benefit for other waste streams (e.g. WEEE)).
- Assumption: higher collection is achieved by collecting additional alkaline batteries which would otherwise end-up in municipal waste (=reduction of losses of alkaline batteries in municipal waste)
- Collecting additional alkaline batteries means: collected batteries of the baseline and in addition these alkaline batteries

Measure 1 – Higher collection target for portable batteries (IIIc)

Alternative options

Option 2: 65% collection target for portable batteries

- The target of the collection rate of portable batteries needs to be significantly higher in order to ensure that environmental risks are reduced/avoided.
- **New collection rate (current methodology): 65% (in e.g. 2030)**
- Consistent reporting and calculation of the collection rate can be supported by labelling of the battery with a QR code which defines the category (portable or industrial) of each battery.
- **For monitoring the success of higher collection rates obligatory waste analysis in all MS shall be established.**
- Systematic waste analyses, e.g. every 3 years, shall be executed in every MS to monitor the amount of batteries in municipal waste (waste analyses would also be of benefit for other waste streams (e.g. WEEE)).
- **Assumption: higher collection is achieved by additionally collecting:**
 - **alkaline batteries which would otherwise end-up in municipal waste (=reduction of losses of alkaline batteries in municipal waste) and**
 - **Li-ion batteries which would otherwise get lost during WEEE recycling or export (=reduction of losses due to WEEE and export)**

Measure 1 – Higher collection target for portable batteries (III d)

Alternative options

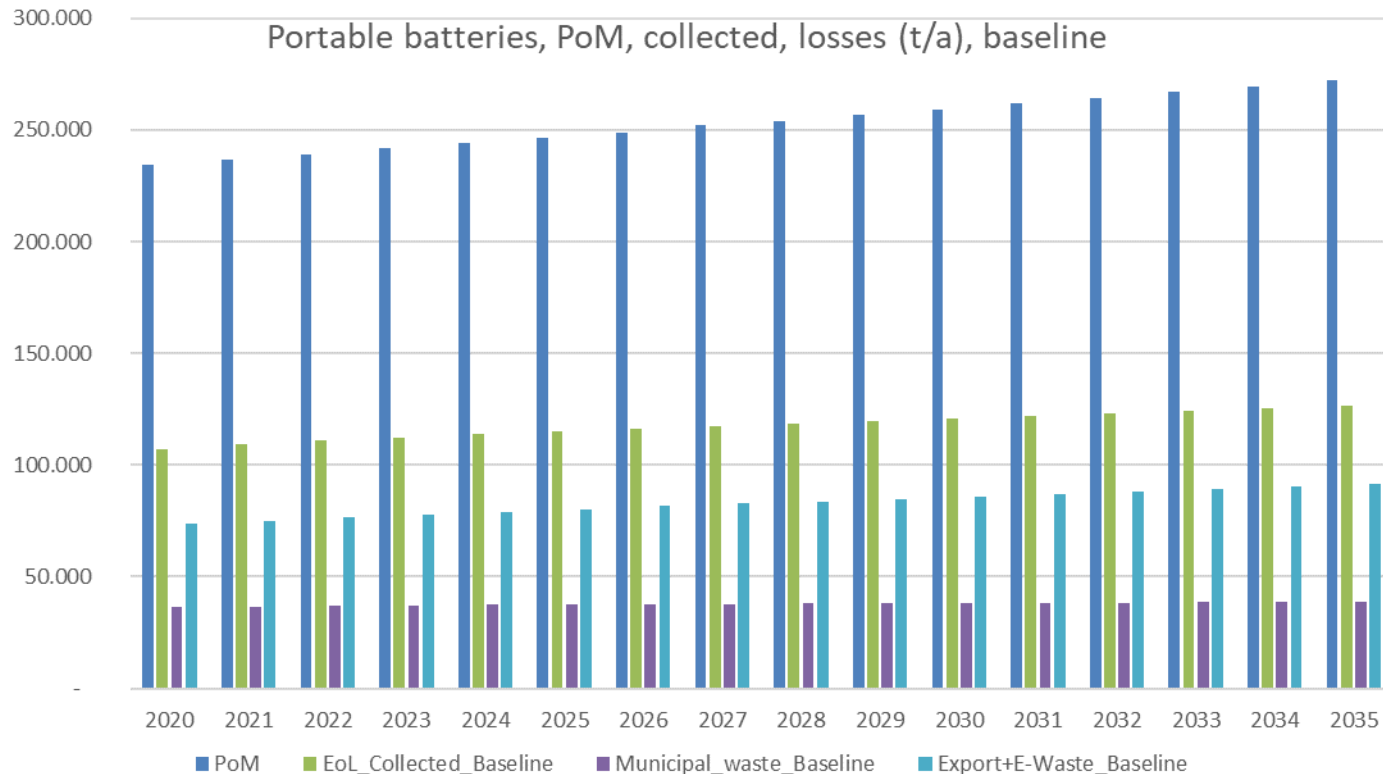
Option 1: 75% collection target for portable batteries

- The target of the collection rate of portable batteries needs to be significantly higher in order to ensure that environmental risks are reduced/avoided.
- New collection rate (current methodology): 75% (e.g. beyond 2030)
- For monitoring the success of higher collection rates obligatory waste analysis in all MS shall be established.
- Systematic waste analyses, e.g. every 3 years, shall be executed in every MS to monitor the amount of batteries in municipal waste (waste analyses would also be of benefit for other waste streams (e.g. WEEE)).
- Assumption: higher collection is achieved by additionally collecting:
 - alkaline batteries which would otherwise end-up in municipal waste (=reduction of losses of alkaline batteries in municipal waste) and
 - Li-ion and alkaline batteries which would otherwise get lost during WEEE recycling or export (=reduction of losses due to WEEE and export)

Measure 1 – Higher collection target for portable batteries (IVa)

Impacts of the options – initial results: baseline

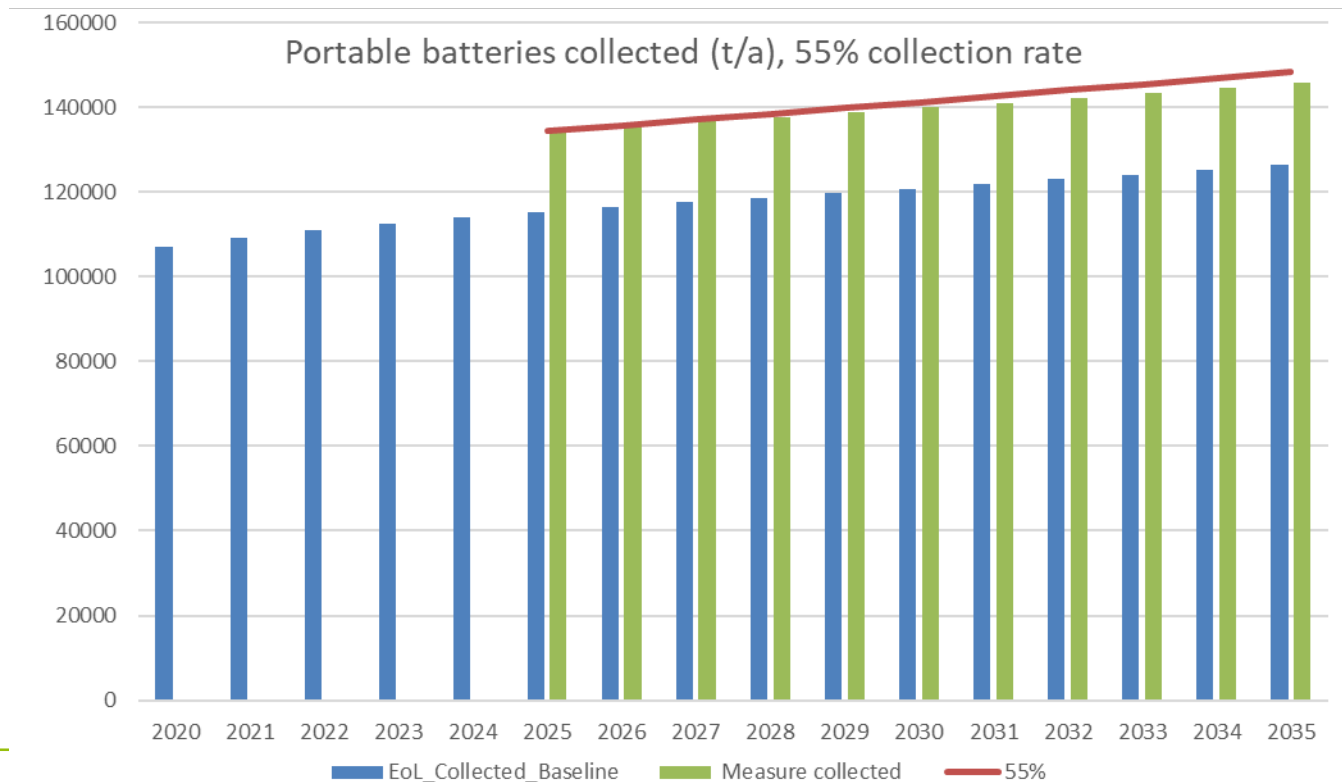
- **Baseline: PoM, collected (EoL_Collected_Baseline) and losses in municipal waste (Municipal_waste_Baseline) and e-waste plus export (Export-E-waste_Baseline).**
- Losses in municipal waste represent ca. 15% of the amounts PoM



Measure 1 – Higher collection target for portable batteries (IVb)

Impacts of the options – initial results: Option 1: 55% collection rate

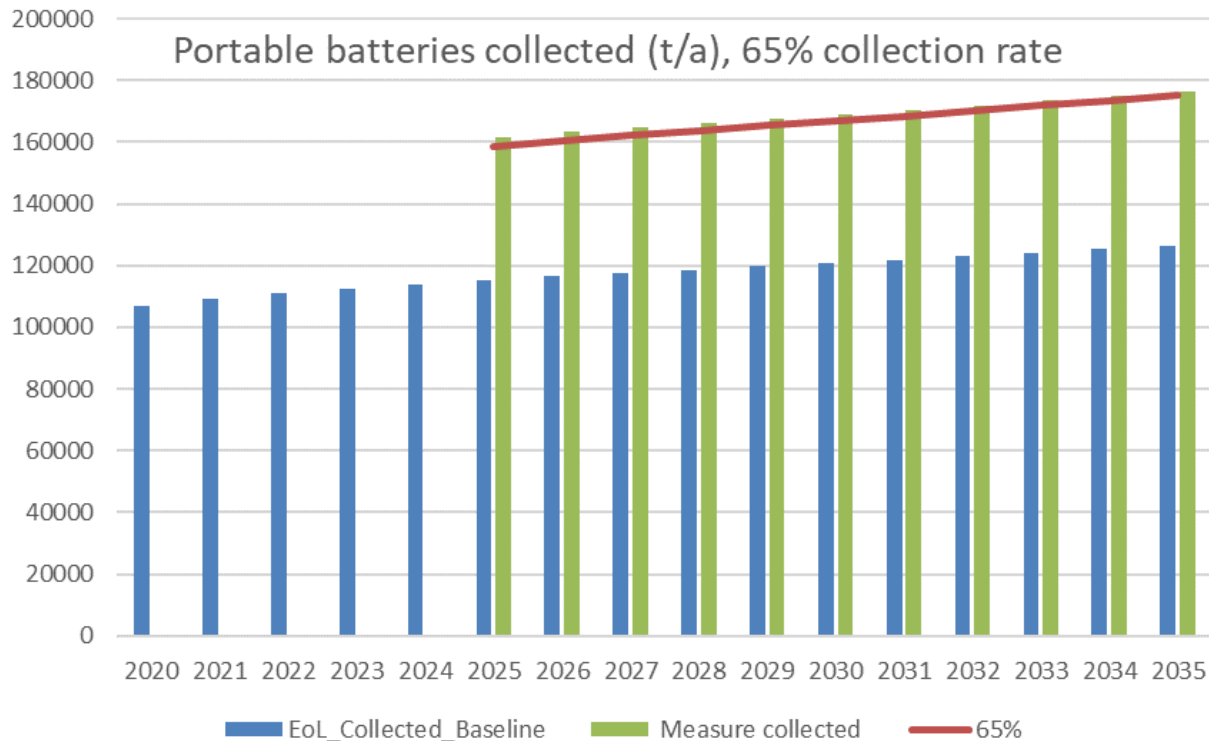
- 50% of the losses in municipal waste are additionally collected (exclusively alkaline)
- For comparison: amounts corresponding to 55% collection rate (=55%) and portables collected baseline (=EoL_Collected_Baseline)
- Result: Additional collection of half the amount ending up in municipal waste (=Measure collected) is almost sufficient to reach a 55% collection rate



Measure 1 – Higher collection target for portable batteries (IVc)

Impacts of the options – initial results: Option 2: 65% collection rate

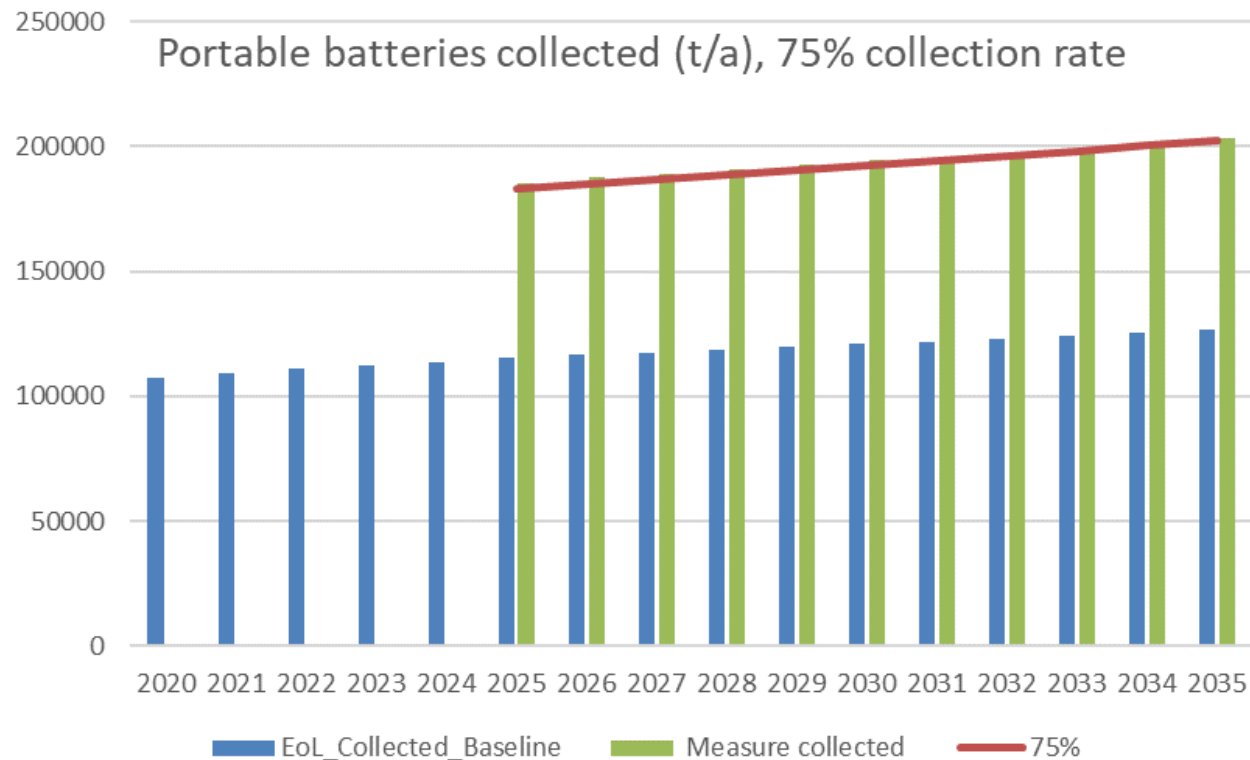
- 70% of the losses in municipal waste are additionally collected (exclusively alkaline) and 25% of the losses from export and e-waste (exclusively Li-ion)
- Result: Additional 70% from batteries in municipal waste and 25% from export / e-waste are sufficient to reach a 65% collection rate



Measure 1 – Higher collection target for portable batteries (IVd)

Impacts of the options – initial results: Option 3: 75% collection rate

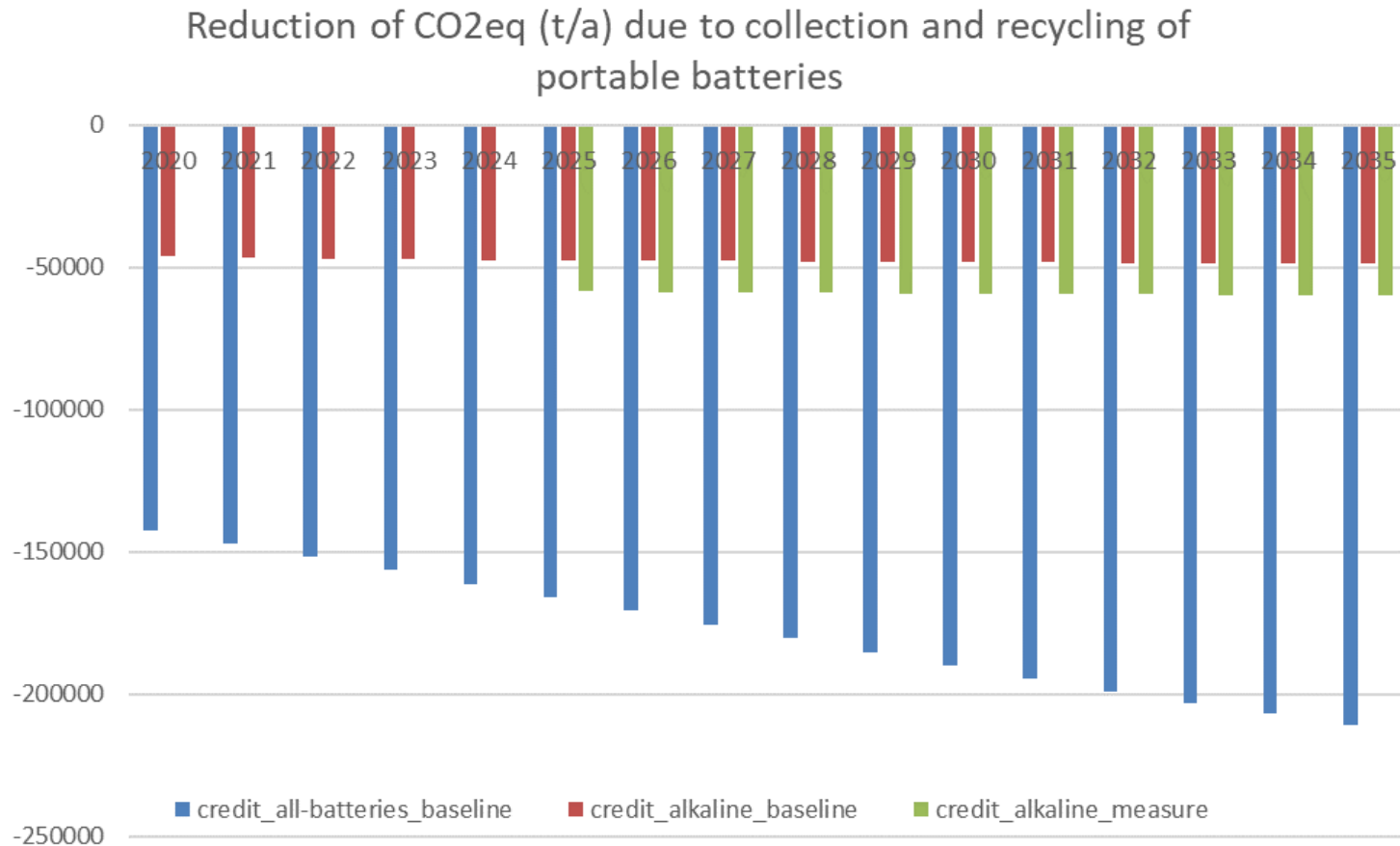
- 80% of the losses in municipal waste are additionally collected and 50% of the losses from export and e-waste
- Result: Additional 80% from batteries in municipal waste and 50% from export / e-waste are sufficient to reach a 75% collection rate



Measure 1 – Higher collection target for portable batteries (IVe)

Impacts of the options – initial results

Option 1: 55% collection rate – greenhouse gas emissions (t CO₂eq/a)



Measure 1 – Higher collection target for portable batteries (IVf)

Impacts of the options – initial results

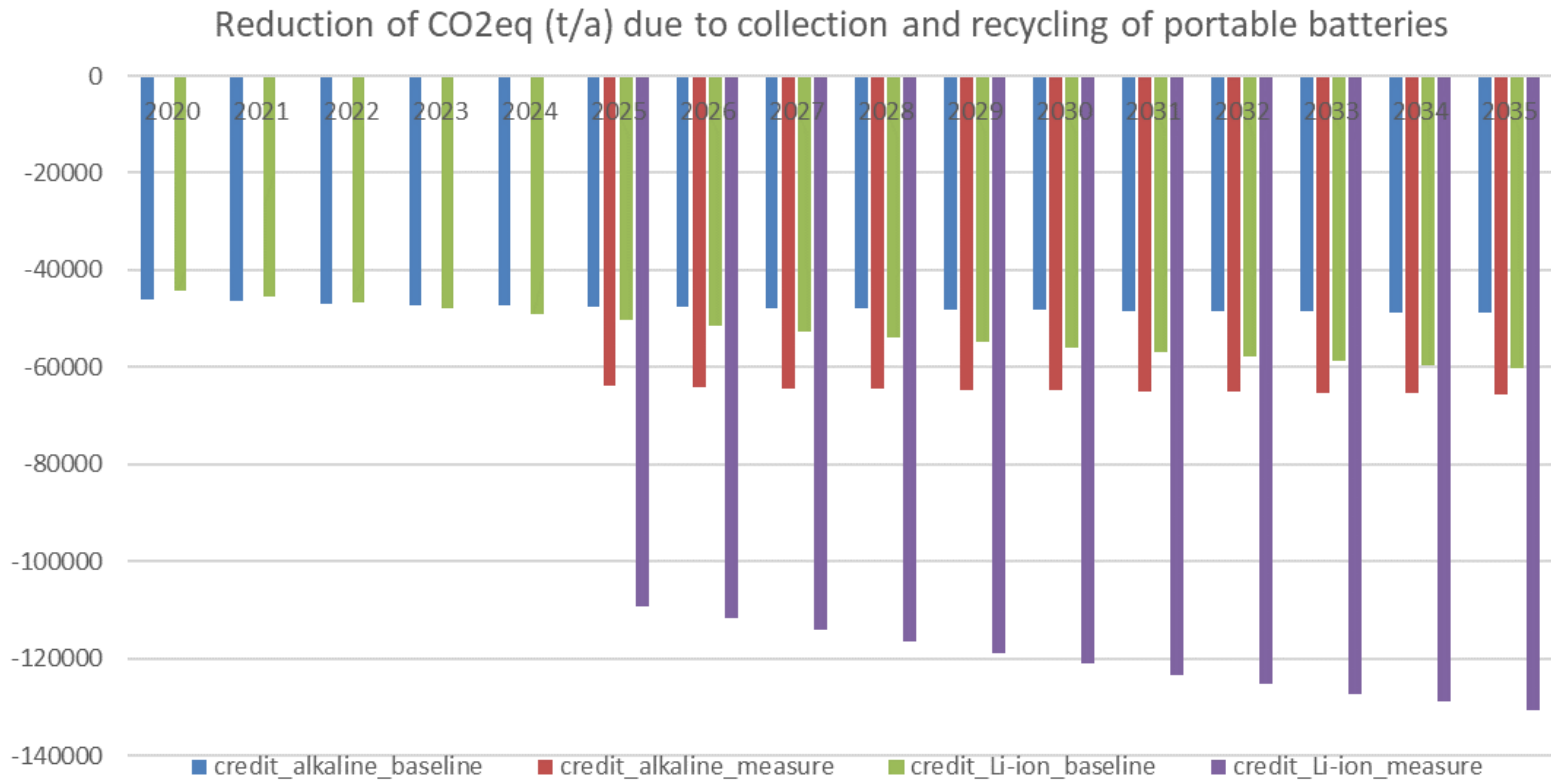
Option 1: 55% collection rate – greenhouse gas emissions (t CO₂eq/a)

- Reduction of CO₂eq (credits) due to avoided primary production of battery material (secondary materials replace primary production)
- Credit_all-batteries_baseline: credits for all portable collected and recycled; baseline 45% collection rate
- Credit_alkaline_baseline: credits for all alkaline batteries collected and recycled; baseline
- Credit_alkaline_measure: credits for all alkaline batteries collected and recycled in baseline plus additional collection of half the amount of all batteries ending up in municipal waste (exclusively alkaline)
- Achieving almost 55% collection with additional alkaline batteries results in an additional reduction of ca. 11 000 CO₂eq t/a (compared to baseline)
- 11 000 CO₂eq t/a correspond to an increase of 23% of the reductions from alkaline recycling in the baseline.
- 11 000 CO₂eq t/a correspond to an increase of ca. 6% of the reductions from recycling of all batteries in the baseline.

Measure 1 – Higher collection target for portable batteries (IVg)

Impacts of the options – initial results

Option 2: 65% collection rate – greenhouse gas emissions (t CO₂eq/a)



Measure 1 – Higher collection target for portable batteries (IVh)

Impacts of the options – initial results

Option 2: 65% collection rate – greenhouse gas emissions (t CO₂eq/a)

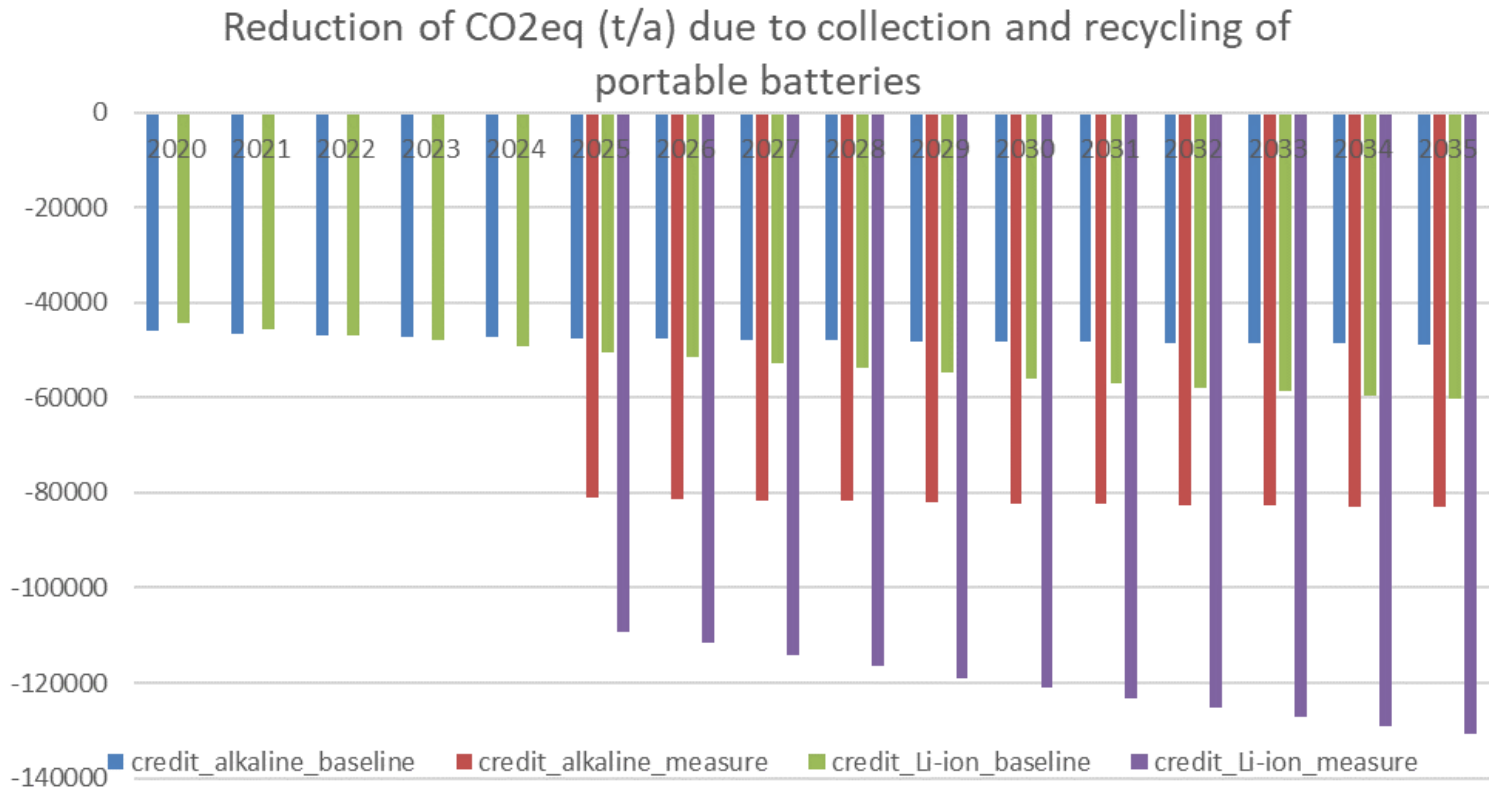
70% of the losses in municipal waste are additionally collected (exclusively alkaline) and 25% of the losses from export and e-waste (exclusively Li-ion)

- Achieving 65% collection with additional alkaline and Li-ion batteries results in an additional reduction of
 - ca. 16 000 to 17 000 CO₂eq t/a compared to alkaline recycling in the baseline
 - ca. 60 000 to 70 000 CO₂eq t/a compared to Li-ion recycling in the baseline
- 16 000 to 17 000 CO₂eq t/a correspond to an increase of 35% of the reductions from alkaline recycling in the baseline.
- 60 000 to 70 000 CO₂eq t/a correspond to an increase of more than 100% of the reductions from Li-ion recycling in the baseline.
- The total reduction (alkaline+Li-ion) 75 000 to 87 000 CO₂eq t/a correspond to an increase of ca. 45% to 40% of the reductions from recycling of all batteries in the baseline.

Measure 1 – Higher collection target for portable batteries (IVI)

Impacts of the options – initial results

Option 3: 75% collection rate – greenhouse gas emissions (t CO₂eq/a)



Measure 1 – Higher collection target for portable batteries (IVj)

Impacts of the options – initial results

Option 3: 75% collection rate – greenhouse gas emissions (t CO₂eq/a)

80% of the losses in municipal waste are additionally collected (exclusively alkaline) and 50% of the losses from export and e-waste (Li-ion+alkaline)

- Achieving 75% collection with additional alkaline and Li-ion batteries results in an additional reduction of
 - ca. 33 000 to 34 000 CO₂eq t/a compared to alkaline recycling in the baseline
 - ca. 60 000 to 70 000 CO₂eq t/a compared to Li-ion recycling in the baseline
- 33 000 to 34 000 CO₂eq t/a correspond to an increase of 35% of the reductions from alkaline recycling in the baseline.
- 60 000 to 70 000 CO₂eq t/a correspond to an increase of more than 100% of the reductions from Li-ion recycling in the baseline.
- The total reduction (alkaline+Li-ion) 92 000 to 105 000 CO₂eq t/a correspond to an increase of ca. 56% to 50% of the reductions from recycling of all batteries in the baseline.

Measure 1 – Higher collection target for portable batteries (IVk)

Impacts of the options – initial results

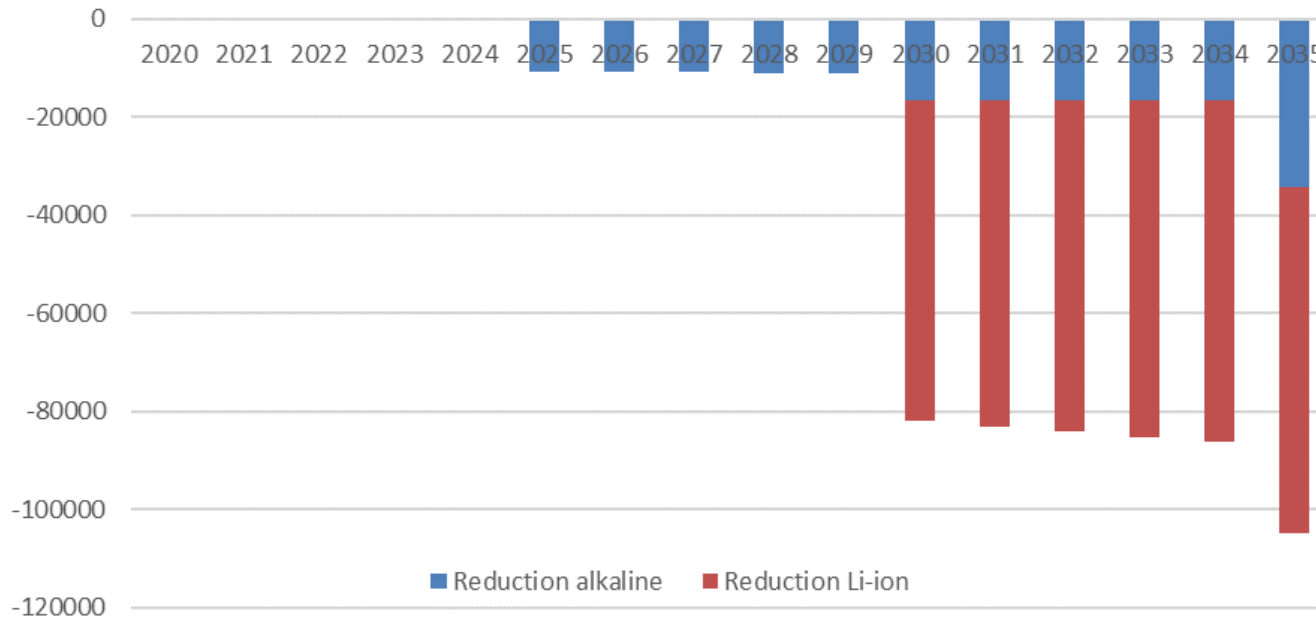
Overview: additional reduction (difference to baseline), t CO₂eq/a; measure: Collection rate 55% 2025 → 65% 2030 → 75% 2035

2025: 11 000 CO₂eq t/a; alkaline (compared to baseline)

2030: 17 000 CO₂eq t/a; alkaline and 65 000 CO₂eq t/a; Li-ion (compared to baseline)

2035: 34 000 CO₂eq t/a; alkaline and 70 000 CO₂eq t/a; Li-ion (compared to baseline)

Total additional reduction measure, t CO₂eq/a



Measure 1 – Higher collection target for portable batteries (IVI)

Impacts of the options – initial results

Environmental impacts

There is a need to avoid losses of batteries into municipal waste in order to reduce the risk of environmental pollution with heavy metals.

There is a need to collect, remove from WEEE and recycle more Li-ion batteries in order to save critical resources and to support a circular economy.

- The collection of an additional 19 000 t alkaline (2025) is sufficient to increase the current collection rate to 55% and to halve the amount of waste batteries that ends up in municipal waste.
- The collection of an additional 20 000 t Li-ion (2025) contributes 43% to the collection target of 65% and represents about a quarter of the losses with WEEE and export.

Measure 1 – Higher collection target for portable batteries (IVm)

Impacts of the options – initial results

Environmental impacts

- 55% collection and subsequent recycling results in a reduction of 11 000 CO₂eq t/a (compared to baseline) (increase of 6% of the reductions from recycling of all batteries in the baseline).
- 65% collection and subsequent recycling results in a reduction of 75 000 to 87 000 CO₂eq t/a (increase of ca. 45% to 40% of the reductions from recycling of all batteries in the baseline).
- 75% collection and subsequent recycling results in a reduction of 92 000 to 105 000 CO₂eq t/a (increase of ca. 56% to 50% of the reductions from recycling of all batteries in the baseline).
- **Reduction of CO₂eq depends on the type of battery being additionally collected :**
 - **Losses into municipal waste are at least for now dominated by primary batteries.**
 - **Regarding losses with WEEE, Li-ion should be addressed.**

Measure 1 – Higher collection target for portable batteries (IVn)

Impacts of the options – initial results

Economic impacts

- 65% collection rate: fees for the end-consumer of portable batteries will not exceed 1.7 Euro per inhabitant and year.
- Highest fees of 1.6 to 1.7 Euro per inhabitant/a and highest collection rates in 2016, Belgium 71% and Switzerland 72% (exceptional rate of Belgium caused by diverse effects (campaign), 2017 and 2018 between 61% and 62%).
- For a collection rate of 55% fees of less than 1.7 Euro per inhabitant/a are expected and more than 1.7 Euro per inhabitant/a to achieve a collection rate of 75%.
- The majority of increasing expenditures of the PRO to achieve higher collection rates will be directed to information campaigns and collection infrastructure.
- Cost for recycling will not increase with the same share as economy of scale effects are expected.

Measure 1 – Higher collection target for portable batteries (IVo)

Impacts of the options – initial results

Economic impacts

Macro-economic effects

- Collection, logistics, sorting and recycling of portable batteries will generate a turnover within the EU.
- The turnover is calculated based on the fees paid by the producer for PoM of portable batteries. When recalculated, this results in a maximum value of about 7 000 Euro per tonne of collected waste portable batteries.
- Additional collection results in an additional turnover of around:
 - 130 million Euro per year; collection rate of 55%
 - 330 million Euro per year; collection rate of 65%
 - 500 million Euro per year; collection rate of 75%

Measure 1 – Higher collection target for portable batteries (IVp)

Impacts of the options – initial results

Economic impacts

Macro-economic effects

- The additional collection and recycling results in the recovery of secondary materials. These secondary materials replace the production of primary material in (mainly) third countries outside the EU.
- The additional turnover within the EU is compared with expenses for the procurement of primary materials from outside the EU:
 - expenses of about 7 million Euro/a for primary materials; collection rate of 55%
 - expenses of about 84 million Euro/a for primary materials; collection rate of 65%
 - expenses of about 95 million Euro/a for primary materials; collection rate of 75%

Administrative costs

- Administrative costs do not depend on the target value. The effort for collection and management of data and calculation of collection rates does not change.

Measure 1 – Higher collection target for portable batteries (IVq)

Impacts of the options – initial results

Social impacts

Employment effects

- Achieving a collection rate of 65% results in an additional turnover (compared to baseline) of about 330 million Euro/a
- Turnover generates about 2 300 new jobs, mainly in small and medium sized enterprises (collection, transport, media/advertising).
(Assumption: main share of turnover can be allocated to campaigns, collection infrastructure etc.; only 1/3 remains for human resources)
- About 900 new jobs are generated when a collection rate of 55% is considered, and 3 500 new jobs for a collection rate of 75%.

Measure 1 – Higher collection target for portable batteries (V)

Comparison of options

Impact	Baseline	1: 55% target	2: 65% target	2: 75% target
Feasibility and necessity of higher target	n.a.	Very high +++	High ++	Low +
Environmental benefits	No /	Reduction of 11 000 CO ₂ eq t/a +	Reduction of 75 000 to 87 000 CO ₂ eq t/a ++	Reduction of 92 000 to 105 000 CO ₂ eq t/a +++
Additional costs (Euro)	No /	Less than 1.7 Euro per inhabitant -	Max. 1.7 Euro per inhabitant --	More than 1.7 Euro per inhabitant. ---
Revenues (Euro)	No /	Secondary Co, Ni, etc. from recycling +	Secondary Co, Ni, etc. from recycling ++	Secondary Co, Ni, etc. from recycling +++
Macro-economic effects	Primary materials from abroad from - to ---	Turnover EU 130 million Euro Primary materials abroad 7 million Euro	Turnover EU 330 million Euro Primary materials abroad 84 million Euro	Turnover EU 500 million Euro Primary materials abroad 95 million Euro
Employment	No /	900 new jobs +	2 300 new jobs ++	3 500 new jobs +++
Administrative burden	No /	No changes /	No changes /	No changes /

Measure 1 – Higher collection target for portable batteries (VI)

Initial conclusions

- ✓ 65% collection and subsequent recycling results in a reduction of 75 000 to 87 000 CO₂eq t/a (=increase of 45% to 40% compared to the reductions from total recycling of all batteries in the baseline).
- ✓ A stepwise increase of the collection targets to 65% within e.g. the next 10 years seems feasible and necessary.
- ✓ Fees for the end-consumer of portable batteries will not exceed 1.7 Euro per inhabitant and year (65%).
- ✓ The majority of increasing expenditures of the PRO (additional turnover of max. 330 million Euro/a) to achieve higher collection rates will be directed to information campaigns and collection infrastructure and generate additional jobs (about 2300 new jobs) accordingly.
- ✓ Additional collection of 80% of the amount ending up in municipal waste (baseline) and 50% of the quantity exported in appliances or lost in the recycling of WEEE is required to achieve a 75% collection rate.

(In case of changes of the categories and industrial batteries would be re-allocated to portable, additional amounts of waste batteries would have to be collected.)

Methodology of calculation of the collection rate (VIIa)

Problem description

- ✓ The method of reporting and calculating the collection rate is no longer adequate: The average service life of batteries is longer than three years and thus the calculation of the collection rate as defined in the Directive does not correctly represent the collection performance in practice.
- ✓ Problems exist in differentiating between portable and industrial Pb-acid batteries which distorts the collection rate. At least five MSs apply (different) thresholds by weight as criteria for distinguishing between industrial and portable Pb-acid batteries.
- ✓ Distinction between portable and industrial batteries used by private consumers is difficult (e.g. e-bikes).
- ✓ There are other reporting challenges and new developments that affect the collection rate; e.g. online sales, second life of batteries
- ✓ Objective: Improve the monitoring of the collection target of portable batteries and development of a level playing field. More realistic calculation of the collection rate; improve the quality of the collection rate

Methodology of calculation of the collection rate (VIIb)

Alternative options

- Changes of the calculation methodology of the collection rate of portable batteries; mainly 2 new approaches are discussed:
 - 6 instead of 3 successive years PoM;
 - “Available for collection” instead of PoM.
- Applying 6 years instead of 3 years PoM for the calculation of the collection rate is not considered a relevant option as this would not result in a relevant improvement of the calculation methodology and not in a more realistic model of the battery mass flows.
- For introducing “available for collection”, an approach similar to WEEE could be developed.
- WEEE: collection rates are based on a calculation tool which calculates the generation of WEEE.
- A new calculation methodology would require developing a new collection target.

Methodology of calculation of the collection rate (VIIC)

Alternative options

Current Situation: Collection target based on PoM

Advantages

- Data on PoM is already available and the methodology is well established
- Progress can be monitored and compared to previous years
- No additional administrative effort

Disadvantages

- Current methodology does not represent the situation on the ground

Methodology of calculation of the collection rate (VIId)

Alternative options

Option 1: Collection target based on batteries “Available for collection“

- Calculating the waste generated by a similar approach as WEEE (Waste calculated based on Weibull distribution and PoM)
- Accordingly a potential EoL (100%) value is calculated for each year
- A problem remains; since no information on losses (municipal waste, WEEE, export) is available, modelling of these mass flows if possible at all, will be difficult and inaccurate:
 - Municipal waste: information from evaluation, but no systematic waste analysis exist in MS and no other comprehensive data is available
 - WEEE: only assumptions and estimations
 - Export: only assumptions and estimations
- Two possibilities:
 - “Available for collection“ does not take into account losses → available for collection is identical with 100% EoL
 - “Available for collection“ takes into account losses → An accurate calculation without any comprehensive knowledge of the above sources of loss is not possible

Methodology of calculation of the collection rate (VIIe)

Alternative options

Option 1: Collection target based on batteries “Available for collection“

Advantages

- A more realistic model of waste batteries generated and available for collection

Disadvantages

- Very difficult to define a target value (new methodology and higher collection compared to current situation need to be considered at the same time) → No knowledge of losses
- Should “Available for collection“ take into account or not losses (municipal waste, WEEE, exports)?
- Data on portable batteries for the time span from PoM to collected exists. However, that does not represent the actual lifetime of batteries as the hoarding time is included. → “Available for collection“ should not take into account the hoarding time.
- Administrative effort to establish and maintain a tool to calculate “Available for collection“
- No experience with a new calculation methodology and target setting for batteries collection → Risk that new target value could be too high or too low.
- Risk that in the future less, instead of more portable batteries will be collected
- Future collection data will no longer be comparable to previous data.

Methodology of calculation of the collection rate (VIIf)

Initial conclusion

- A major improvement of the quality of the collection rate and the development of a level playing field is expected due to better distinction between industrial and portable batteries (see measure on change of categories)
 - The overall objective is to increase the collection of portable batteries. A collection target and the calculation methodology have to allow to monitor and to measure progress towards the target. Comparability between MS has to be ensured. A projection of reality is not necessarily a requirement for this.
 - “Available for collection” is a more realistic model of waste batteries generated. However, it does not solve the problem of missing data on losses (municipal waste, WEEE, exports).
 - Defining a new collection target based on “available for collection” is considered more difficult compared to the current methodology.
-
- A situation, where in future less, instead of more portable batteries will be collected (due to wrong target setting for “available for collection”) must be prevented.
 - In view of possible risks and the foreseeable difficulties in developing a practicable target related to “available for collection”, it is questionable whether the unclear benefits justify the necessary effort.
 - MS could decide whether they want to use PoM or “available for collection” (newly to be developed) as method for the collection target (similar to WEEE)