Follow-up of WRBRF
May 2013 – March 2015

The Advanced Rechargeable & Lithium Batteries Association

10. Update on Re-Use & Second Use of batteries. Extended Producer Responsibility

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1. Circular Economy - Background

According to Article 23 of the Batteries Directive 2006/66/EC,
"*The Commission shall review the implementation of this Directive and the impact of this Directive on the environment and the functioning of the internal market".*
DG Environment indicated that they will start preparing a report near the end of 2016.

Last year, at the end of 2015, the EU Commission also launched a strategic plan:
'Closing the loop - An EU action plan for the Circular Economy'.
Some of the action points for the period 2016-2019 which have a direct impact on rechargeable batteries include:

- From waste to resources: boosting the market for secondary raw materials.
- Encourage recovery of critical raw materials.
- Encourage reuse activities.
- Improve general requirements for extended producer responsibility schemes.

In general, concrete actions covering the whole product lifecycle in a circular economy.

2. Extending the life cycle of batteries: what is the environmental impact ?

- A Product Environmental Footprint (PEF) is a technical study based on Life Cycle Analysis (LCA) providing information on the environmental impacts of a product during its whole life.
- 9 impact categories for batteries in the Commission PEF Pilot phase.

ILCD classification	Impact Category	Applicable to batteries Pilot
I	IPCC global warming, excl biogenic carbon	Yes
I	Particulate matter/Respiratory inorganics, Humbert (2009)	Yes
I	Ozone depletion, WMO model, ReCiPe	Yes
I	IPCC global warming, incl biogenic carbon	Yes
II	Resource depletion. mineral. fossils and renewables. midpoint (v1.06)	**No**
II	Acidification midpoint (v1.06)	Yes
II	Ionising radiation midpoint. human health (v1.06) [kBq U235 eq]	Yes
II	Photochemical ozone formation, LOTOS-EUROS model, ReCiPe	Yes
II	Eutrophication terrestrial midpoint (v1.06)	Yes
II	Marine eutrophication, EUTREND model, ReCiPe	Yes
II	Eutrophication freshwater midpoint (v1.06)	Yes
II/III	Human toxicity non-canc. effects, USEtox (recommended)	**No**

2. Extending the life cycle of batteries: extended use-phase scenarios

How is the battery really used ?

Two scenarios analyzed for 3 type of batteries:

1. Minimum scenario: based on battery IEC life cycle standard,
2. Typical scenario: based on application life duration (may include « second-life »)

Energy consumption by the battery in the use phase				
Battery type	**Cordless Power tool**	**ICT (phones-laptops Li-Ion)**	**Electric Vehicle**	**Unit**
Energy consumption in the use phase over the life time (scenario 1)	40	71	45	kWh over life time/kg battery
Energy consumed in the use phase over the life time (scenario 2)	82	199	70	kWh over life time/kg battery

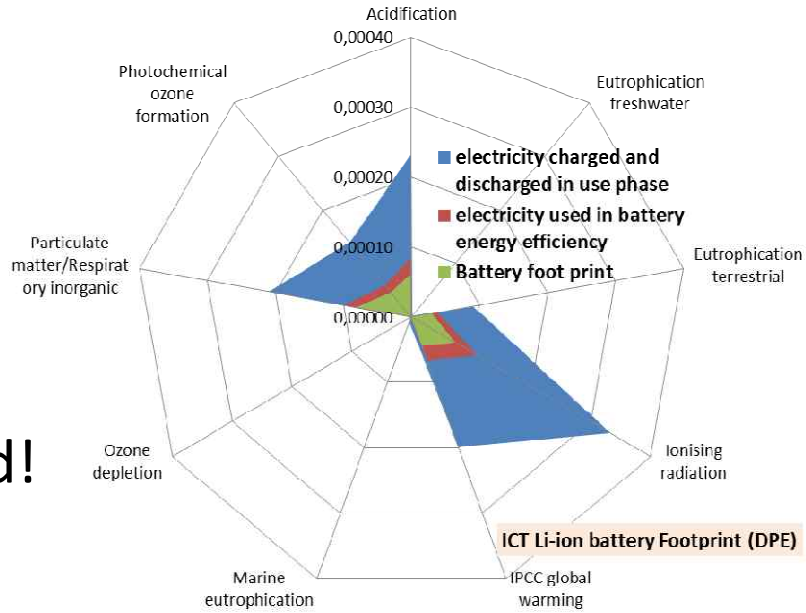
2. Extending the life cycle of batteries: environmental impact of the extended use-phase

PEF calculation result:
Environmental impact reduced from 24% to 60%, according the scenarios and type of impacts

Impact Category	CPT Li-ion Deviation	ICT Li-ion Deviation	e-mobility Li-ion Deviation
Acidification midpoint (v1.06) [Mole of H+ eq.]	44%	51%	26%
Eutrophication freshwater midpoint (v1.06) [kg P eq]	45%	54%	24%
Eutrophication terrestrial midpoint (v1.06) [Mole of N eq.]	49%	60%	34%
Ionising radiation midpoint. human health (v1.06) [kBq U235 eq]	47%	57%	29%
IPCC global warming. excl biogenic carbon [kg CO2-Equiv.]	46%	52%	29%
IPCC global warming. incl biogenic carbon [kg CO2-Equiv.]	44%	51%	26%
Marine eutrophication. EUTREND model. ReCiPe [kg N-Equiv.]	44%	51%	26%
Ozone depletion. WMO model. ReCiPe [kg CFC-11 eq]	48%	57%	32%
Particulate matter/Respiratory inorganics. Humbert (2009) [kg PM2.5-Equiv.]	50%	63%	36%
Photochemical ozone formation. LOTOS-EUROS model. ReCiPe [kg NMVOC]	47%	58%	27%

2. Extending the life cycle of batteries: a significant reduction of environmental impacts!

- The battery footprint profile is very similar to the electricity profile.
- Increasing the life duration is increasing the energy usage.
- But thanks to a longer usage of the battery material, all the environmental impacts are reduced!



3. The definitions of portable, automotive, industrial batteries

- Since the implementation of the Directive, these definitions have structured the end of life of batteries. The required structures have been set up for each battery category according the Directive requirements.

- The collection schemes, funded by the industry placing the batteries on the market, are now operational in all the European countries.

- The industry has identified and set up solutions for take back of industrial batteries at their end of life. It is important to mention that the e-mobility companies have often organized dedicated take back networks for their products.

- The automotive batteries (mainly lead-acid batteries) are benefitting of a dedicated organization, linked to the ELV legislation, showing a high efficiency for the collection of batteries.

4. Critical issues regarding the extended life

1. There are currently no definitions of re-use and second use in the Batteries Directive 2006/66/EC.

2. Re-use is defined in the Waste Framework Directive 2008/98/EC and in the Waste Electrical & Electronic Equipment Directive 2012/19/EU. *"any operation by which products or components that are not waste are used again for the same purpose for which they were conceived."*

3. Cases of portable, automotive and industrial batteries require separate analysis.

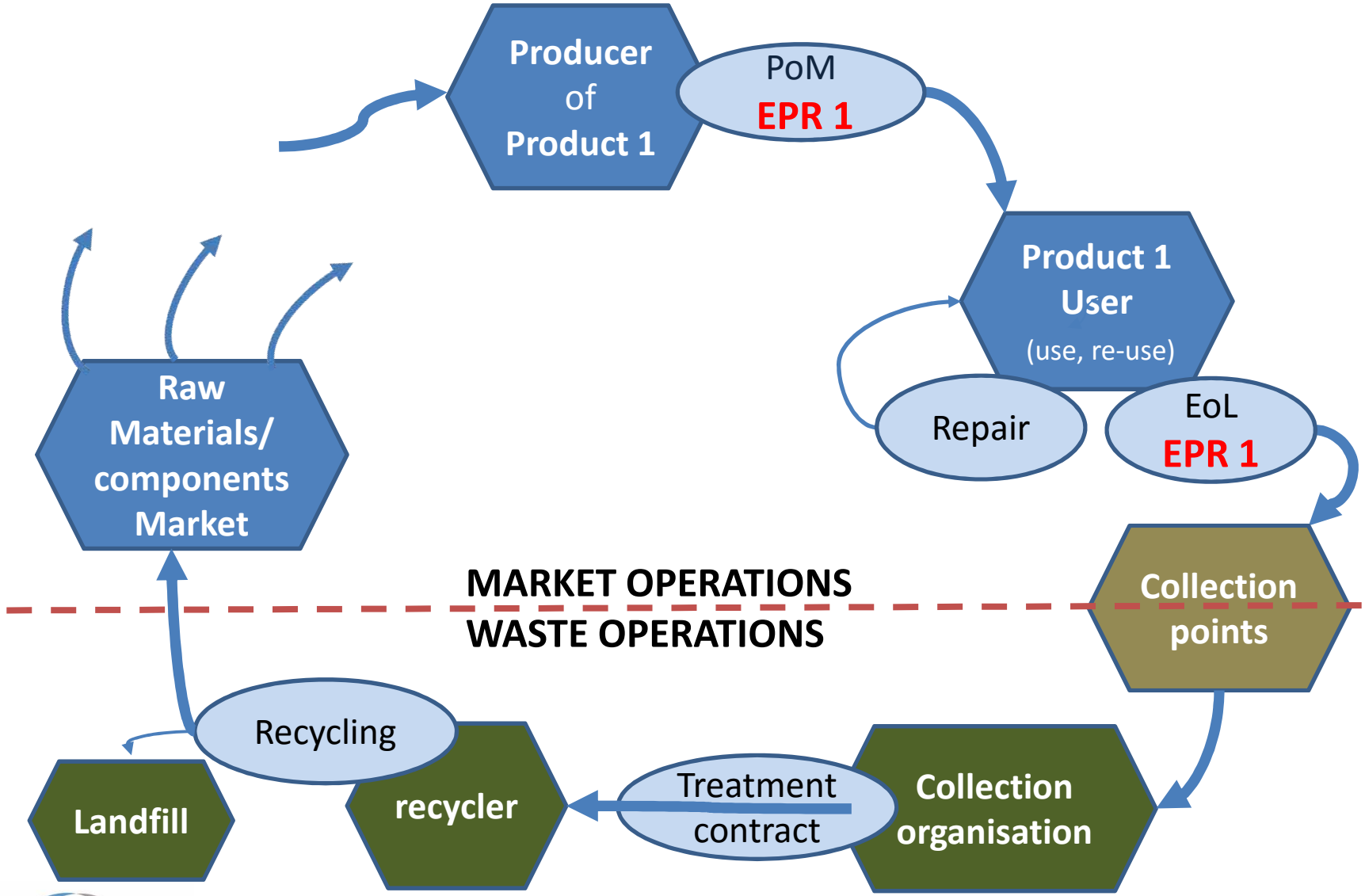
3.a: In the categories portable and automotive, the flow from placing on the market till final recycling is rather straightforward:

4. Critical issues regarding the extended life

Portable batteries that can no longer be used are being discarded by the end user, and therefore become immediately waste and collected through the various national collection schemes and at municipality waste collection sites.

Automotive batteries (for SLI-purposes – Starting, Lighting, Ignition) are predominantly lead-acid batteries. Since lead(Pb) has a high positive value, there is a well-functioning collection and treatment scheme to recycle lead.

4. EPR application in simple case (i.e. Portable)



4. Critical issues regarding the extended life

3.b: For the category of industrial batteries, definitions of re-use and second use are extremely important to clarify the extended producer responsibilities, as currently, this is still, even at legal level, a very grey zone.

Need of distinction between 'take back' and 'discarded': not all industrial batteries that are taken back can be considered de-facto discarded (discarded=waste). At the end of 'first life', if the battery is still 'usable', then the battery can be completely, or partly, be 're-used' or used for a 'second use' application.

Reference to definitions of 'waste' and 'end-of-waste' in presentation 9.

5. Case of Re-use / Second use for industrial batteries: electric vehicles

Industrial batteries for the traction of e-mobility vehicles (hybrid, plug-in hybrid, full electric, fuel cell):

- They have a rather long life time (at least for the duration of the warranty period, and even beyond) and a high value.
- The car manufacturer will try to extend the lifetime by conducting thorough diagnose at the time a failure would occur on the battery.
- These 'intelligent' industrial batteries require very specific electronic management throughout is complete life time.

Overall, one cannot compare such type of batteries with more consumer-oriented portable and automotive batteries.

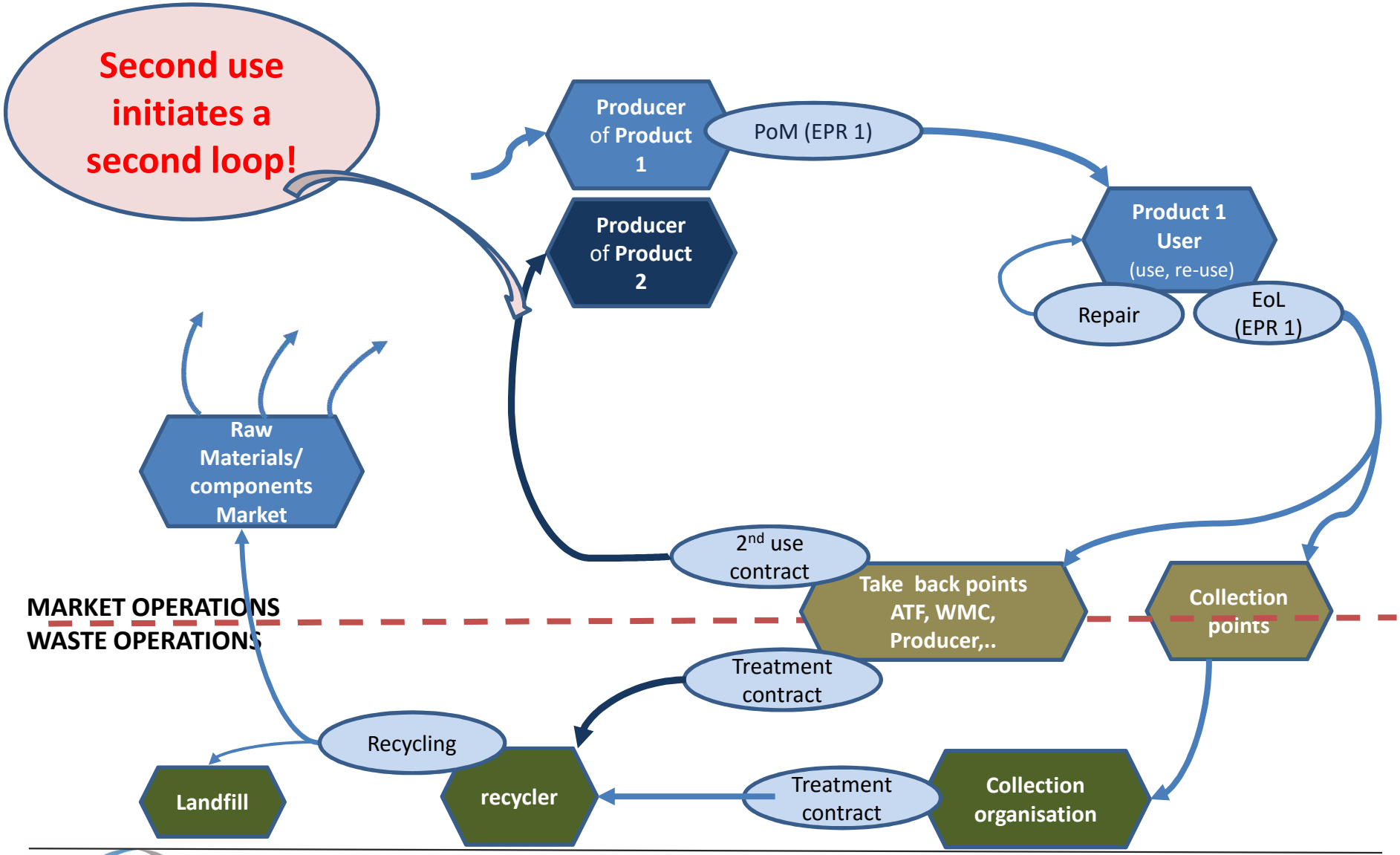
5. Case of Re-use / Second use for industrial batteries: electric vehicles

- The diagnosis conducted by the car manufacturer or its designed expert and trained technician will allow for the car manufacturer to decide which sub-component of the battery needs to be replaced (stack, module, cell) in order to bring that battery again in the loop for the same use as it was initially designed for. This is **re-use.**

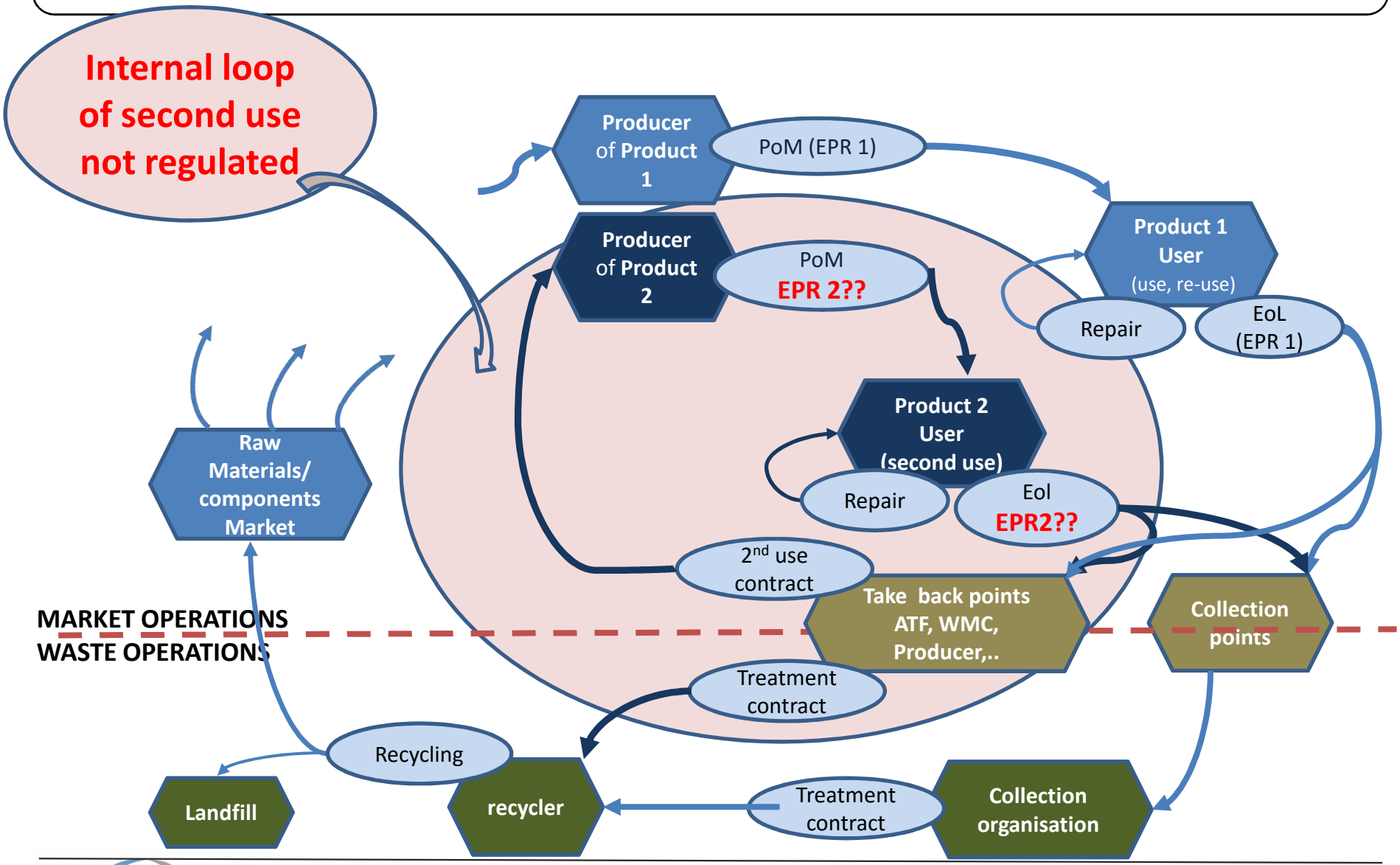
- Some car manufacturers bring the 'refurbished' or 'remanufactured' battery back into use for another application than for its initial purpose (the traction of the e-vehicle). They modify this intelligent battery from a mobile application (e-vehicle) to a stationary application (energy storage unit). This is **second use**.

- If this is achieved within the company structure, there's in fact no change of ownership and the extended producer responsibility remains with the initial producer. What if there is a change of ownership ?

EPR application in complex case (i.e. Industrial)



EPR application in complex case (i.e. Industrial)



5. Re-use / Second use (industrial batteries)

- It is possible that another entity would purchase the initial intelligent battery, makes a conversion, and brings that converted battery on the market for another application that for the initial purpose (the traction of the e-vehicle).

- In that cast this entity should be considered a new producer bringing a new battery on the market, and as such, should be obliged to fulfill all legal and regulatory requirements, such as registration as battery producer in the EU Member State where this new battery type ins being placed on the market, the take-back obligation, the reporting obligation, and to ensure that the recycling efficiency target is reached.

This transfer of ownership and the consequently change of extended producer responsibility is currently not regulated in the Directive, and remains a grey zone with regard to define clear responsibilities for producers.

6. Proposal 1:

Harmonize the definitions throughout the Waste legislation.

RECHARGE proposes to harmonize all definitions throughout the Waste legislations and to further clarify these definitions in the FAQ.

As an example:

The definition of 'placing on the market', meaning supplying or making available, whether in return for payment or free of charge, to a third party within the Community and includes import into the customs territory of the Community.

In the WEEE Directive, 'placing on the market' is defined as: the first making available of a product on the market within the territory of a Member State on a professional basis.

6. Proposal 2:

Keep the current definitions of portable, automotive, industrial batteries as the existing base structure of the directive.

‘portable battery or accumulator’ means any battery, button cell, battery pack or accumulator that:(a) is sealed; and (b) can be hand-carried; and (c) is neither an industrial battery or accumulator nor an automotive battery or accumulator;

‘automotive battery or accumulator’ means any battery or accumulator used for automotive starter, lighting or ignition power;

‘industrial battery or accumulator’ means any battery or accumulator designed for exclusively industrial or professional uses or used in any type of electric vehicle;

6. Proposal 3:

<u>Include definitions of re-use and of second use, and adjust the Directive Articles accordingly.</u>

Definitions in article 3:

"**Re-use** means any operation by which batteries or accumulators that are not waste are used again for the same purpose for which they were conceived ".

RECHARGE proposes to include in the FAQ, to clarify the EPR responsibility at the end of life: in the case of re-use, the EPR of the first placing on the market is maintained.

A repair (refurbishment) of a battery is considered a sub-set of re-use, and does not change the EPR for the producer/importer having placed that battery on the market for the first time.

6. Proposal 3:

Definitions in article 3:

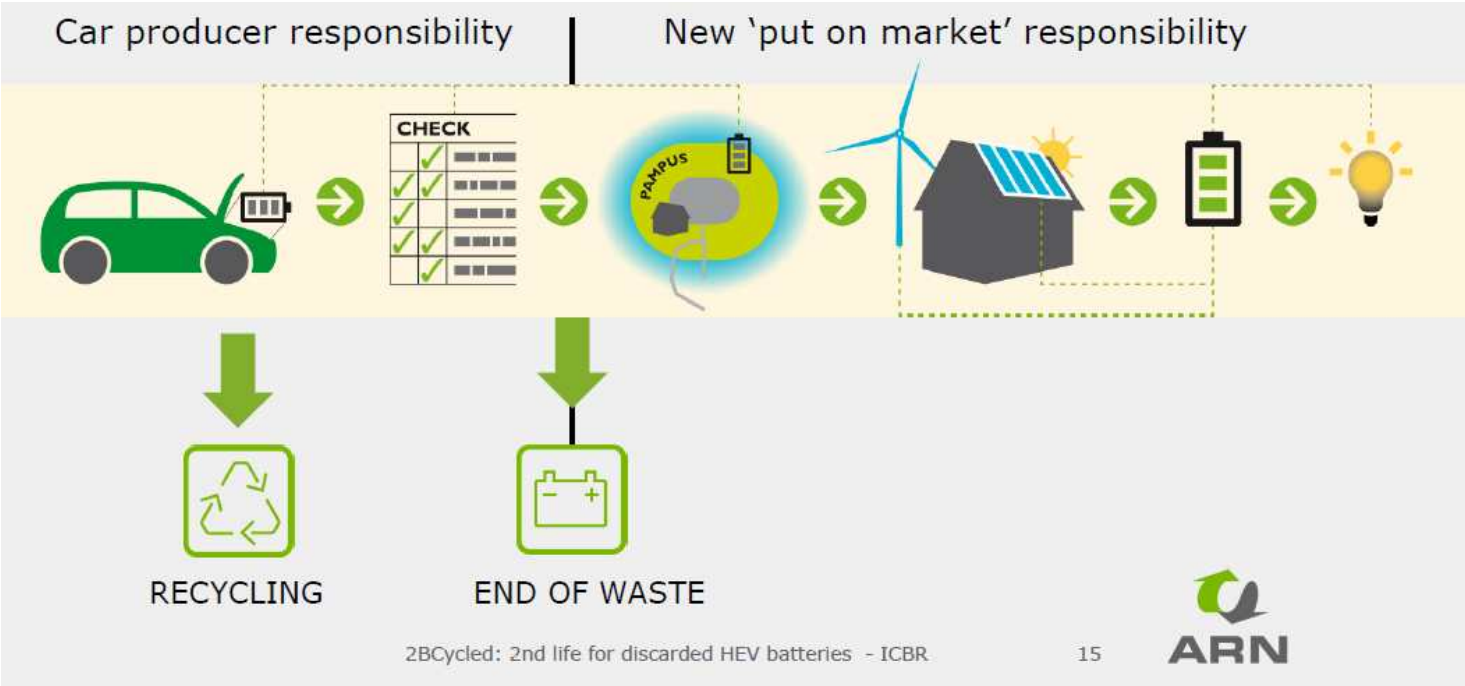
"**Second use** means any operation by which batteries or accumulators that are not waste are used for a different purpose for which they were conceived and placed on the market for the 1st. time."

RECHARGE proposes to include in the FAQ, to clarify the EPR responsibility at the end of life: in the case of second-use, a new EPR is applicable:

A remanufacturing of a battery for a second use does change the EPR, as that second used battery is used for a different purpose than the battery put on the market for the first time. The importer/producer/remanufacturer of the second use battery has now the EPR obligation (and other obligations of the Batteries Directive and Regulation on the calculation of RE), irrespective of a new label or not.

6. Proposal 3: second use example

"**Second use** means any operation by which batteries or accumulators that are not waste are used for a different purpose for which they were conceived and placed on the market for the 1st. time."



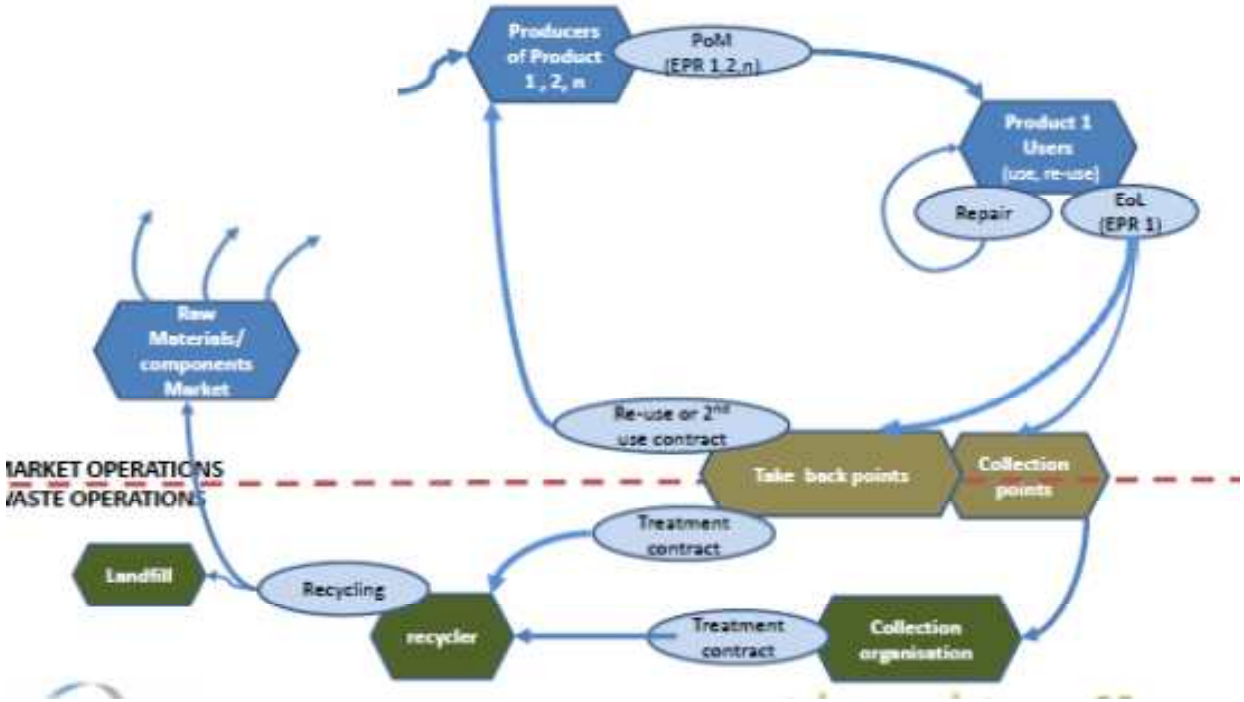
6. Proposal 3:

Definition of Producer in article 3:
Addition at the end of the paragraph:

(12)'producer' means any person [….].
In case of battery reuse, the producer definition is unchanged. In case of battery second-use, the producer is the person placing the battery on the market for the first time for these second use, in the sense of the definition above.

7. Overall conclusion

With the new definitions of re-use and second use, and the adjustments in the applicable Articles, the Extended Producer Responsibility becomes legally clear.



Any extension of the battery life time is considered a great contribution to the principles of the Circular Economy, by using materials longer, and again, before they become waste.

Thank you for your kind attention !

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