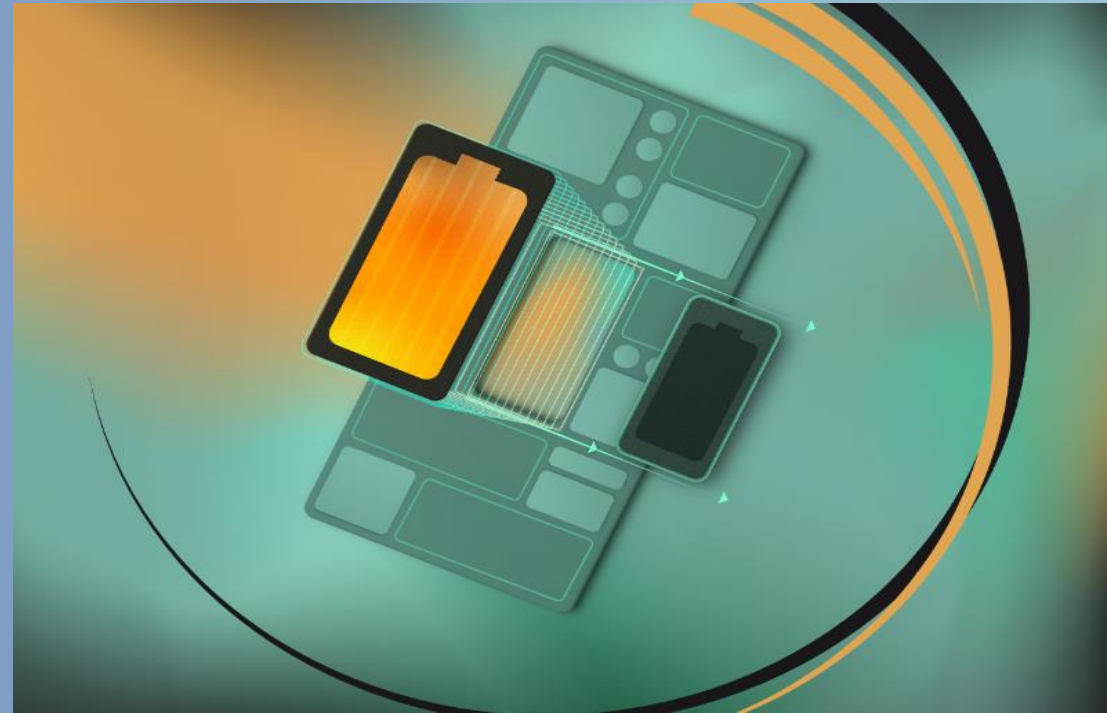


# Battery Removability and Replaceability

Support to the development of  
Guidelines for Battery  
Regulation Art.11



Chris Spiliotopoulos and Chiara Magrini, Joint Research Centre – B5  
Stakeholder consultation meeting – 15 June 2023

# Battery RR stakeholder meeting 15/06/23 - Attendance Guidelines

- When joining the meeting, please identify yourself by your first and last name, and your organisation, e.g. *John Smith – JRC Seville*
- **Please keep your microphone muted and camera switched off when not speaking.**
- To intervene during the Q&A sessions:
  - 1) *Please ask for the floor by using the meeting chat (e.g. by typing “FLOOR”). Please **do not use** the “raise hand” button.*
  - 2) *You can also type questions in the chat box while a presentation is taking place. Please keep your intervention short and succinct, and avoid posting long texts with positions.*
  - 3) *Please wait for the chair to give you the floor. Chronological order will generally be sought, as reasonably as possible in order to also allow for a diverse range of stakeholders to intervene.*
  - 4) *To speak, unmute your microphone. After speaking, please mute your line again.*

# Agenda

1. Welcome and introduction to the meeting
2. Discussion on draft document
  - 2.1 RR concepts – *Art. 11.1* (Presentation and Q&A)
  - 2.2 RR by independent professionals – *Art. 11.2 & Art. 11.5* (Presentation and Q&A)  
  
*--- Short Break ---*
  - 2.3 Derogations – *Art. 11.3* (Presentation and Q&A)
  - 2.4 Use of Software – *Art. 11.8* (Presentation and Q&A)
3. Next Steps / AOB

# (Draft) Article 11 – Paragraph 9

*9. The Commission shall publish guidelines to facilitate harmonised application of this Article.*

# Guidelines – General principles

- *The Guidelines cannot amend or conflict with the regulatory provisions;*
- *The Guidelines follow a principle-based approach, rather than product-by-product approach, as far as possible;*

# Article 11 – Paragraph 1

1. *Any natural or legal person that places on the market products incorporating portable batteries shall ensure that those batteries are readily removable and replaceable by the end-user at any time during the lifetime of the product. That obligation shall only apply to entire batteries and not to individual cells or other parts included in such batteries.*

*A portable battery shall be considered readily removable by the end-user where it can be removed from a product with the use of **commercially available tools**, **without requiring the use of specialised tools**, unless provided free of charge with the product, proprietary tools, thermal energy, or solvents to disassemble the product.*

*Any natural or legal person that places on the market products incorporating portable batteries shall ensure that those products are accompanied with instructions and safety information on the use, removal and replacement of the batteries. Those instructions and that safety information shall be made available permanently online, on a publicly available website, in an easily understandable way for end-users.*

*This paragraph shall be without prejudice to any specific provisions ensuring a higher level of protection of the environment and human health relating to the removability and replaceability of portable batteries by end-users laid down in any Union law on electrical and electronic equipment as defined in Article 3(1), point (a), of Directive 2012/19/EU.*

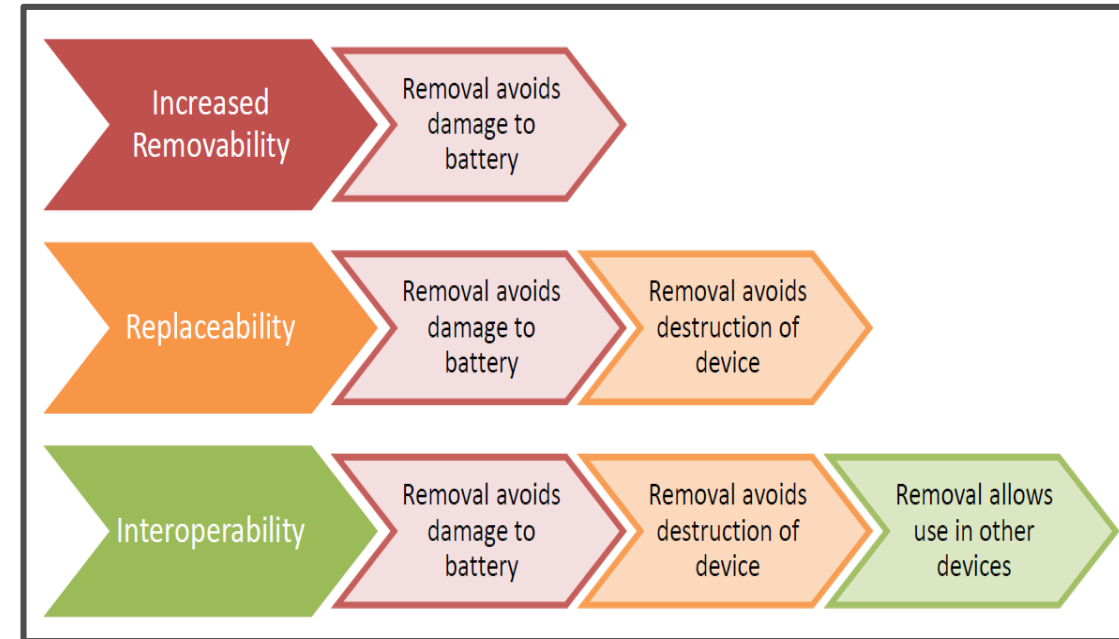
# Definitions

- **Removability** of the battery is understood to be possible when the battery can be safely taken out of a device (with or without the use of tools), in some cases resulting in the destruction of the device (Stahl et al, 2020).

→ NOT a disassembly process as in the definition of disassembly in standard EN45554:2020: a process whereby a product is taken apart in such a way that it could subsequently be reassembled and made operational.

- **Replaceability** is defined as a battery being “removable with tools commonly available to the end-user” and without destruction of the device or battery, thus enabling replacement to support further operation of the device (Stahl et al, 2020).

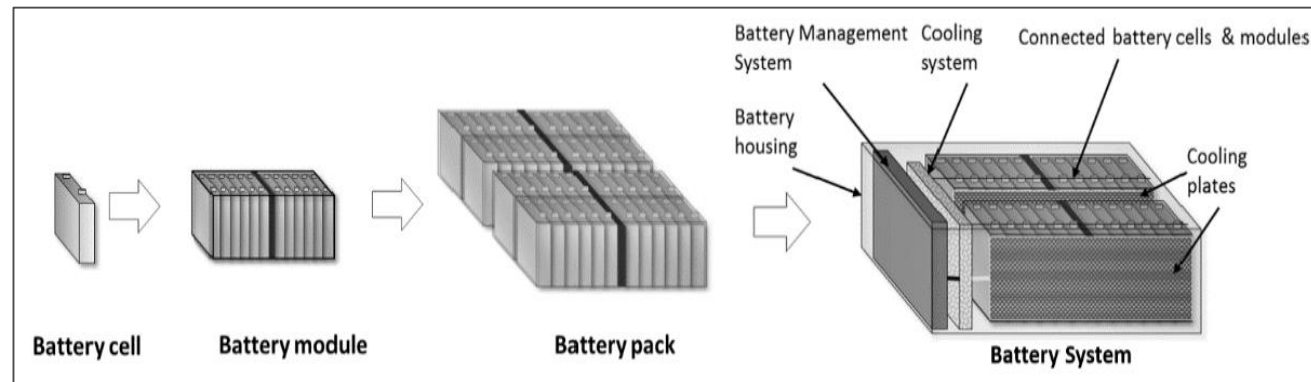
→ The concept of replaceability entails an altogether non-destructive disassembly process.



Source: Stahl et al, 2020

# Other general considerations

- The guidelines apply to **battery packs**, and not to individual cells or other parts included in the batteries, **except from** the case of light means of transport (LMT) batteries as described in Art. 11.
- The guidelines only applies to batteries and products placed on the market once Article 11 comes into force.
- *For provisions related to removability and replaceability by an end-user, the end-user is understood to be a person of 14 years of age or higher (in line with scope of Directive 2009/48/EC on the safety of toys).*



Source: Bielewski et al, 2021



# Qualification of RR concepts

EU: end-users ; IP: independent professionals

Parameter*		Removability	Replaceability
1. Disassembly Depth	EU	Reasonable number of disassembly steps. For example, batteries are attached to the product in a way that no other product components (without accounting for fasteners and connectors) to be removed before the battery, except for a protective cover.	(same as remove)
	IP	(as above)	(as above)
2. Tools, fasteners and joining techniques	EU	the concept of removability refers to the use of commercially available tools, without requiring the use of specialized tools, unless provided free of charge with the product, proprietary tools, thermal energy, or solvents to disassemble / use of the same type of fasteners and of a low number of fasteners for battery attachment to the device.	(same as remove)
	IP	the concept of removability refers to the use of commercially available tools, without requiring the use of proprietary tools. As per EN 45554:2020, proprietary tools refer to tools not available for purchase by the general public or for which any applicable patents are not available to license under fair, reasonable, and non-discriminatory terms.	(as above)

\*Parameters based on relevant ones from EN 45554:2020

# Qualification of RR concepts

**EU:** end-users ; **IP:** independent professionals

Parameter		Removability	Replaceability
3. Disassembly Information*	EU	availability for removal by end-users	Info relates not only to disassembly, but, upon battery replacement, to reassembly and normal device operation. Incl. elements such as software tools or firmware required for full functionality of the device after battery replacement.
	IP	availability for removal by independent operators	(as above for independent professionals)
4. Spare battery availability	EU	N/A	Spare battery are available: <ul style="list-style-type: none"> <li>• to end users.</li> <li>• during the entire lifetime of the appliance/device.</li> </ul> Any <b>software</b> (and its updates) that might be necessary for the normal operation of the battery within the appliance is available to the same target groups and the same period of time as the physical battery itself.
	IP	N/A	(as above for independent professionals)

\* The following types of information can be considered as relevant in the context of battery removal:

- a disassembly map or exploded view for the battery removal;
- technical manual of instructions for removal.

# Interaction with ecodesign regulation for mobile phones, cordless phones and slate tablets

Type of Req.	Codesign regulation requirements	Battery reg req.	Req. when both into force
Spare avail. to pro's	7 years	5 years	7 years
Spare battery avail. to end-users	7 years, unless: <ol style="list-style-type: none"> <li>after 500 full charge cycles the battery has, in a fully charged state, a remaining capacity of at least 83 % of the rated capacity;</li> <li>the battery endurance in cycles achieves a minimum of 1000 full charge cycles and after 1000 full charge cycles the battery has, in a fully charged state, a remaining capacity of at least 80 % of the rated capacity;</li> <li>the device meets IP67 rating.</li> </ol>	5 years	<ul style="list-style-type: none"> <li>7 years, if conditions in ecodesign reg are not met</li> <li>5 years, if conditions in ecodesign reg are met</li> </ul>
Serialised battery/ Software affecting replacement	Until at least 7 years: <ul style="list-style-type: none"> <li>provide non-discriminatory access for professional repairers and end-users to any software tools, firmware or similar auxiliary means needed to ensure the full functionality of the spare battery and of the device in which it is installed during and after the replacement;</li> <li>provide, on a free access website of the manufacturer, importer or authorised representative, a description of the procedure for the notification and authorisation of the intended replacement of the battery by the owner of the device; the procedure shall allow for remotely providing the notification and authorisation;</li> <li>Before providing access to the software tools, firmware or similar auxiliary means, the manufacturer, importer or authorised representative may only require to have received a notification and authorisation by the owner of the device. Such notification and authorisation may also be provided by a professional repairer with the explicit written consent of the owner;</li> <li>Manufacturers, importers or authorised representatives shall provide access to the software tools, firmware or similar auxiliary means within 3 working days after having received the request and, where applicable, the notification and authorisation.</li> </ul>	Software shall not be used to impede the replacement of a portable battery or LMT battery, or of their key components, with another compatible battery or key components.	Software shall not be used to impede the replacement of a portable battery or LMT battery, or of their key components, with another compatible battery or key components.
Disassembly Tools	Feasible with no tool, a tool or set of tools that is supplied with the product or spare part, or basic tools; <u>, or with Commercially Available Tools if:</u> <ul style="list-style-type: none"> <li>the process for battery replacement meets the criteria set out;</li> <li>after 500 full charge cycles, battery must have in a fully charged state, a remaining capacity of at least 83 % of rated capacity;</li> <li>the battery endurance in cycles achieves a minimum of 1000 full charge cycles, and after 1000 full charge cycles the battery must, in addition, have in a fully charged state, a remaining capacity of at least 80 % of the rated capacity;</li> <li>device is at least dust tight and protected against immersion in water up to one meter depth for a min of 30 minutes.</li> </ul>	End-user disassembly with Commercially Available Tools without use of thermal energy and solvents.	End-user disassembly with BASIC Tools without use of thermal energy and solvents.

# Questions?

# Article 11 – Paragraphs 2 and 5











2. *By way of derogation from paragraph 1, the following products incorporating portable batteries may be designed in such a way as to make the battery removable and replaceable only by independent professionals:*
  - (a) *appliances specifically designed to operate primarily in an environment that is regularly subject to **splashing water, water streams or water immersion and that are intended to be washable or rinseable**;*
  - (b) ***professional medical imaging and radiotherapy devices**, as defined in Article 2, point (1) of Regulation (EU) 2017/745, and **in-vitro diagnostic medical devices**, as defined in Article 2, point (2) of Regulation (EU) 2017/746.*

*The derogation set out in point a) of this paragraph shall only be applicable where such derogation is required to ensure the safety of the user and the appliance.*
5. *Any natural or legal person that places on the market products incorporating LMT batteries shall ensure that those batteries, as well as individual battery cells included in the battery pack, are readily removable and replaceable by an independent professional at any time during the lifetime of the product.*

# Concept of independent professionals

- **Definition:** “operators who have the technical competence to repair the product where the battery is integrated in and comply with the applicable regulations for repairers of electrical equipment in the Member States where it operates.”
- **Verification:** “Compliance with this point may be demonstrated by a reference to an official registration system as professional repairer (when such system exists in the Member States concerned), or by registration with, or training/certification by, the manufacturer of the product where the battery is integrated in (when required by national legislation).”
- **Liability:** “An independent professional is understood to be covered by insurance covering liabilities resulting from its activity regardless of whether this is required by the Member State.”

# Appliances specifically designed to operate primarily in a wet environment

0	No protection		-
1	Protected against vertically falling water drops		Vertically falling drops shall have no harmful effects
2	Protected against vertically falling water drops when enclosure tilted up to 15°		Vertically falling drops shall have no harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical
3	Protected against spraying water		Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects
4	Protected against splashing water		Water splashed against the enclosure from any direction shall have no harmful effects
5	Protected against water jets		Water projected in jets against the enclosure from any directions shall have no harmful effects
6	Protected against powerful water jets		Water projected in powerful jets against the enclosure from any direction shall have no harmful effects
7	Protected against the effects of temporary immersion in water		Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardized conditions of pressure and time
8	Protected against the effects of continuous immersion in water		Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7
9	Protected against high pressure and temperature water jets		Water projected at high pressure and high temperature against the enclosure from any direction shall not have harmful effects

Source: <https://www.iec.ch/ip-ratings>

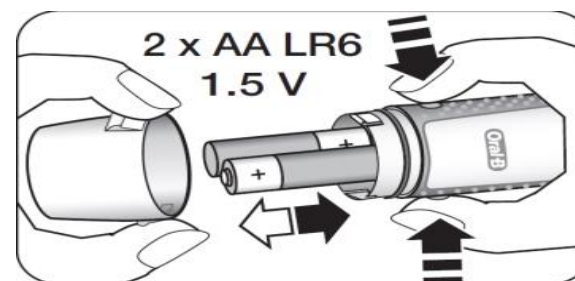
# Appliances specifically designed to operate primarily in a wet environment

- Provision refers to (a) “specifically designed” appliances, operating (b) primarily in such environment that is (c) regularly subject to such conditions. It should not to be understood as an exemption for any device that may be used occasionally or circumstantially in such environment as an additional feature beyond its main function.

Examples:

- ✓ Products such as oral hygiene appliances (e.g. toothbrushes, shavers, hair clippers, epilators); intended to be washable and therefore normally operate in such environment as part of their main function.
- ✗ Products such as mobile phones or smartwatches; normally operating in such environment is not part of their main function, even if they could be circumstantially/coincidentally used in such environment, or even if they could offer the additional feature of being “washable”, “rinseable”, “water-resistant” or “waterproof”

- Paragraph 2 “only applicable where this is required to ensure the safety of the user and the appliance”. So there may still be appliances used in wet environment with batteries replaceable by end-users.



Source: <https://oralb.com/en-us/products/toothbrushes/battery-toothbrushes/pro-health-clinical-battery-toothbrush/>



# Questions?

# Article 11 – Paragraph 3

3. The obligations laid down in paragraph 1 shall not apply where *continuity of power supply is necessary and a permanent connection between the product and the respective portable battery is required to ensure the **safety** of the user and the appliance or, for products that collect and supply data as their main function, for **data integrity** reasons.*

# Safety

## Derogation for:

- equipment connected with the protection of Member States' essential security interests, arms, munitions and war material, with the exclusion of products that are not intended for specifically military purposes (art.1, p 5)
- equipment designed to be sent into space (art.1, p 5)
- equipment and protective systems intended for use in potentially explosive atmospheres (Directive 2014/34/EU)
- devices that perform life-saving and life-sustaining functions (Regulation 2017/745 and Regulation 2017/746, case of hearing aids, Directive 2012/19/EU)

# Devices that perform life-saving and life-sustaining functions

MEDICAL DEVICES	Examples of product functions (non-exhaustive)	Examples of products (non-exhaustive)
Class I	Mostly non-invasive / passive devices	Electric wheelchairs; Dental curing lights; Electric hospital beds; Dental patient chairs; Examination lamps
Class IIa	active therapeutic devices intended to administer or exchange energy; intended to allow direct diagnosis or monitoring of vital physiological processes	Gamma cameras; Electrocardiographs; Electronic thermometers; Electronic stethoscopes; Electronic blood pressure measuring equipment; external hearing aids;
Class IIb	administer energy to or exchange energy with the human body in a potentially hazardous way, taking account of nature, density and site of application of the energy; could result in immediate danger to patient	Electrically powered heat exchangers; external pacemakers and external defibrillators with no integrated or incorporated diagnostic function; Diagnostic X-Ray machine; Computed Tomography Devices
Class III	intended specifically for use in direct contact with the heart or central circulatory system or the central nervous system	Cortical electrodes; active implantable;

✚ Class D, Regulation 2017/746

✚ WEEE D.: devices expected to be infective prior to end of life, and active implantable medical devices

✚ Hearing aids

# Data Integrity

- Similarly to the case of appliances operating in a wet environment, regulatory text defines both the function, (data collection and supply), as well as the specific reason justifying such exemption (data integrity).

## Examples:

- ✓ Battery-powered instruments used in weather stations or in laboratories is the continuous collection of data, and this continuity is an integral part of the function deeming the continuity of power supply necessary.
- ✓ batteries whose main function is to power a non-volatile memory itself, or deliver backup functions in the internal clock of a device, such as those found in processors or in sensors
- ✗ delivers a data collection and supply function as an additional feature (beyond its main function), nor for any device that may contain a component which delivers a data collection and supply function.
- ✗ delivers a data collection and supply function, as a primary function, but does not pose a risk of data integrity loss, due to, for example, the presence of non-volatile memory in the device.

(e.g. a mobile phone, or a battery-powered Wi-Fi hotspot router)

# Questions?

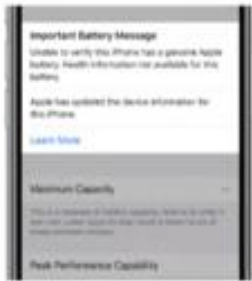
# Article 11 – Paragraph 8

- 8. Software shall not be used to impede the replacement of a portable battery or LMT battery, or of their key components, with another compatible battery or key components.*

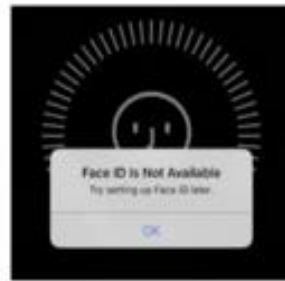
# Software limitations



Screen  
●●●●●



Battery  
●●●●●



Face ID  
●●●●●



Touch ID  
●●●●●

Source: Alfieri and Spiliotopoulos, 2023

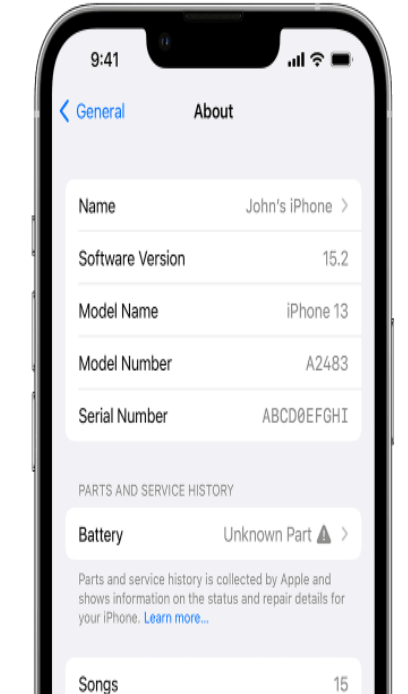
An Unknown Part  message will appear if the battery installation is incomplete or if the battery:

- Was replaced with a nongenuine battery
- Was already used or installed in another iPhone
- Isn't functioning as expected

An additional message might appear that says "Apple has updated the device information for this iPhone." This means that Apple has updated the device information maintained for this iPhone for service needs, safety analysis, and to improve future products.

These messages don't affect your ability to use your iPhone or your battery.

Learn more about [iPhone parts and service history](#).



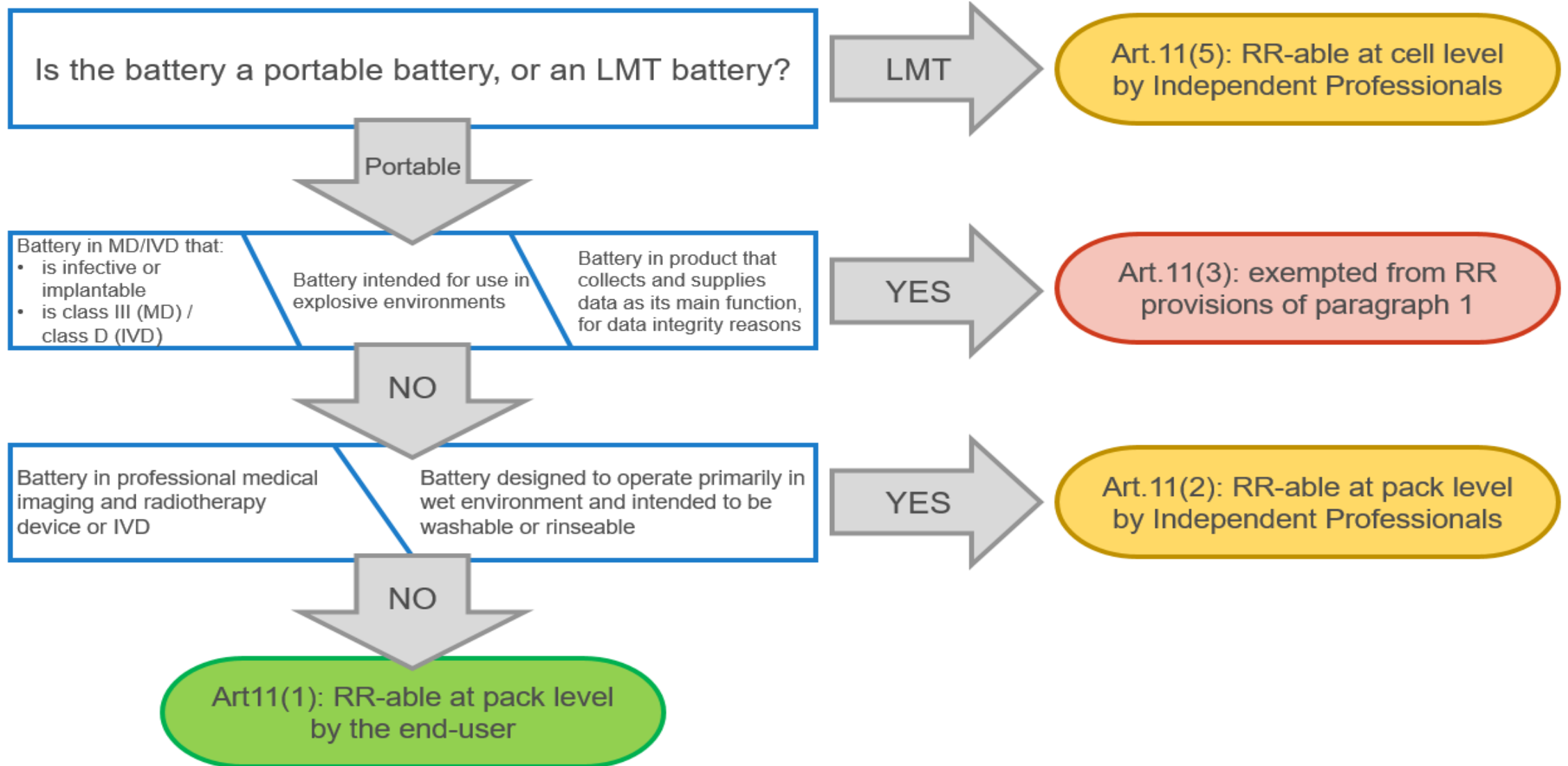
Source: Apple <https://support.apple.com/en-us/HT210323>



# Summary

Reason	Type	Application	Remove/Replace-ability
Safety	Products Dir. 2014/34/EU	Intended for use in potentially explosive atmospheres	Derogation
	Devices in contact with water	Specifically designed; primarily, regularly operating in $\geq$ IPX4	Independent professionals
Medical	Medical devices (Reg. (EU) 2017/745)	Class I (except professional medical imaging, radiotherapy devices, infective and implantable devices)	End-Users
		Class IIa (except professional medical imaging, radiotherapy devices, infective and implantable devices)	
		Class IIb (except professional medical imaging, radiotherapy devices, infective and implantable devices)	
		Professional medical imaging, radiotherapy devices	
	In-vitro diagnostic medical devices (Reg. (EU) 2017/746)	Class III / infective and implantable	Full Derogation
		Class A (except infective and implantable)	Independent professionals
Class B (except infective and implantable)			
	Class C (except infective and implantable)		
	Class D (except infective and implantable)	Full Derogation	
Data Integrity	Products that collect and supply data as main function		Derogation
LMT			Independent professionals

# Decision Tree



# Questions?

# Thank you

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Slide 15: image; source: <https://www.iec.ch/ip-ratings>

Slide 16: image; source: <https://oralb.com/en-us/products/toothbrushes/battery-toothbrushes/pro-health-clinical-battery-toothbrush/>

Slide 24: right-hand side image; source: <https://support.apple.com/en-us/HT210323>