Repurposing of Electric Vehicle Batteries for Energy Storage

A review of the current legal framework and proposals for improvement

Daniel Torán Saltó

Master's Thesis in European and International Trade Law

HARN63

Semester 2 (Summer 2022)

LUND UNIVERSITY

SCHOOL OF ECONOMICS AND MANAGEMENT

Table of Contents

Abstract

Circular economy has recently become a central part of European policy, bridging the environmental and economic policy domains closer than ever in an attempt to fulfil enhanced environmental ambitions. As economic operators seek to adopt innovative solutions, the issue of how established legal frameworks hamper or facilitate them becomes central.

This thesis examines this point in relation to one of such proposed solutions: the reuse of electric vehicle batteries (EVBs) in energy storage applications. It seeks to ascertain the conditions under which EVBs are waste, the obligations on handlers, and the responsibility for EVBs in second life cycles. Methodologically, it explores the key points related to the business model by drawing on European and national legislation, as well as case-law of the Court of Justice of the European Union.

First, the thesis describes the current legal framework and points to specific uncertainties that might prevent the widespread adoption of the business model. A broad and expansive definition of waste, the lack of provisions on second uses, and the inexistence of the notion of repurposing all create important uncertainties for economic operators. While deploying a battery reuse business may be lawful, the legal uncertainty and potential high costs may prevent the market from growing.

Second, the thesis examines proposed changes through the European Commission's proposal for a new regulation on batteries to assess the extent to which it tackles existing shortcomings. While the proposed changes introduce some provisions on repurposing and second uses, some uncertainties will remain. This is because the overall waste management framework has been built on environmental protection premises, with circular economy considerations only recently added

Abbreviations

ELV	End-of-life vehicle
EoW	End of waste
EPR	Extended Producer Responsibility
EV	Electric Vehicle
EVB	Electric Vehicle Battery
WFD	Waste Framework Directive

1. Introduction

1.1 Background: EU climate commitments and the European Green Deal

In December 2015 countries around the world signed up to the Paris Agreement on climate change, seeking to keep global warming "well below 2ºC above pre-industrial levels" while "pursuing efforts to limit [it] to 1.5ºC above pre-industrial levels".[1] Upon the agreement's entry into force, UN officials hailed it as "a powerful confirmation of the importance nations attach to combating climate change" and "a testament to the urgency for action".[2]

However, keeping to those warming limits will require greenhouse gas emissions to peak before 2025, followed by drastic emissions reductions through to 2050.[3] Such an urgent timeline has prompted jurisdictions around the world to take action to address their emissions.

In the European Union, climate change has been one of the overarching priorities of the Commission appointed in 2019. In her speech to the European Parliament when presenting her College of Commissioners, Commission President Ursula von der Leyen stated:

> "If there is one area where the world needs [Europe's] leadership, it is on protecting our climate. [⋯] We do not have a moment to waste on fighting climate change. The faster Europe moves, the greater the advantage will be for our citizens, our competitiveness and our prosperity".[4]

The Commission's communication on the European Green Deal fleshed out its vision and expectations for climate action, establishing an overarching framework under which environmental and sectoral EU legislation is being reviewed to align

[1] Paris Agreement (adopted 12 Deccember 2015, entered into force 4 November 2016) UNTS 3156 Article 2

[2] UNFCCC, 'Landmark Climate Change Agreement to Enter into Force' (5 October 2019) < https://unfccc.int/news/landmark-climate-change-agreement-to-enter-into-force > Accessed 26 May 2022.

[3] IPCC, 'Summary for Policymakers' in P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.), *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2022).

[4] European Commission, 'Speech by President-elect von der Leyen in the European Parliament Plenary on the occasion of the presentation of her College of Commissioners and their programme' (27 November 2019) < https://ec.europa.eu/commission/presscorner/detail/en/speech_19_6408 > Accessed 26 May 2022.

it with the Union's new climate goals (which include a legally binding 2050 climate neutrality target).[5]

To achieve said goals and justify the need for far-reaching legal reforms, the Green Deal emphasizes the positive outcomes of the transition to carbon-neutral economic systems:

> "[The European Green Deal] is a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use."[6]

One of the key ways in which decoupling between resource use and economic growth is expected to be achieved is the concept of the Circular Economy. The Circular Economy Action Plan – one of the deliverables under the Green Deal – seeks to reform EU product law and policy to advance towards more sustainable products,[7] as well as address waste legislation in order to prevent waste, promote recycling, and enhance the quality of waste streams.[8]

However, despite the growing attention paid to the concept in policy and business circles, Circular Economy remains a remarkably vague phrase. For instance, a 2017 review identified 114 definitions of the term.[9] Even as European legislation is revised in light of the European Green Deal, the concept remains confined to policy statements. There is no Circular Economy legal concept.[10]

Therefore, when studying Circular Economy legally, we must approach it through the proxy of what is known as circularity strategies – ways in which the overall

[5] Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 [2021] OJ L243/1(European Climate Law).

[6] European Commission, 'The European Green Deal' (Communication) COM (2019) 640 final (European Green Deal), p. 2.

[7] European Commission, 'A new Circular Economy Action Plan: For a cleaner and more competitive Europe' (Communication) COM (2020) 98 final (Circular Economy Action Plan), pp. 3 to 6.

[8] Ibid, p. 13.

[9] J Kirchherr, D Reike and M Hekkert, 'Conceptualizing the circular economy: An analysis of 114 definitions' [2017] Resources, Conservation & Recycling 221.

[10] C Backes, 'The Waste Framework Directive and the Circular Economy' in M Peeters and M Eliantionio (eds), *Research Handbook on EU Environmental Law* (Edward Elgar Publishing 2020), p. 340. There are some mentions to circular economy within the body of pieces of legislation (such as Article 1 of the WFD, on the Directive's Subject Matter and Scope). However, there's no instrument addressing it specifically.

vision of Circular Economy may be realized in a particular situation, such as reusing or recycling.[11]

Waste prevention and the promotion of more efficient material use have been part of EU waste legislation since its inception in 1975, when the first predecessor of the current Waste Framework Directive (WFD) was adopted.[12] Nowadays, the WFD contains important provisions on waste prevention and on the prioritization of reuse over recycling, and of recycling over disposal (as established in general in Article 4 of the WFD, but also in many other provisions). Additionally, other pieces of legislation – such as the Ecodesign directive – seek to reduce resource use through improved efficiency.

However, circularity is a relative newcomer to EU waste management law and policy.[13] The lack of a coherent approach to circularity within the legal framework might open space for incoherent provisions that hamper the effective implementation of circularity strategies. This is all the more so given that the pursuit of potentially contradictory objectives is sometimes a conscious choice – as exemplified by the WFD, which, while approaching waste from an environmental protection perspective, contains provisions on the promotion of reuse and recycling.

1.2 Purpose and research questions

Therefore, the purpose of this research is threefold:

First, it seeks to describe the current legislative framework applicable to the repurposing and reuse of Electric Vehicle Batteries (EVBs) in the European Union.

Second, once said legislative framework has been defined and described, the thesis seeks to analyze to what extent and under what conditions it prevents or makes possible the adoption and upscaling of this business model. The promotion of reuse

[11] Kirchherr, Reike and Hekkert (n9), p. 227. Although the authors identify 9 circularity strategies in the definitions they study (Refusing, Rethinking, Reducing, Re-using, Repairing, Refurbishing, Remanufacturing, Repurposing, Recycling, and Recovering), Reduce-Reuse-Recycle combinations were found to be the most common. This suggests some level of agreement on what the core of circularity is.

[12] Council Directive 75/442/EEC of 15 July 1975 on waste [1975] OJ L194/39.

[13] T Turunen, 'Deconstructing the Bottlenecks Cause by Waste Legislation: End-of-Waste Regulation' [2017] Journal for European Environmental & Planning Law 186, pp. 190 to 194.

and of life-cycles that minimize environmental impact is a crucial point for the EU's ambitions to transition to a Circular Economy, in light of the Commission's policy communications and the Waste Hierarchy contained in the Waste Framework Directive.

Finally, drawing on this analysis, we will single out key areas where legislative changes would support a reuse business model for EVBs, and analyze ongoing legislative proposals in the area.

To address the thesis' purposes, the following questions will be answered:

1. Under what conditions are used Electric Vehicle Batteries (EVBs) waste?
2. If they are waste, what obligations does that status trigger and how can they be used again?
3. Where does responsibility for the EVBs lie as they move between their first and second life? How is such responsibility implemented?
4. In light of the above, how do the current and future frameworks align with EU ambitions in terms of promoting circular economy?

1.3 Methodology

To address the research questions, this thesis will adopt an empirical legal research approach. This approach combines traditional legal research with an attention to law in practice through the experiences of actors engaging with it in their day-to-day lives.[14] Thus, it addresses the internal aspects of the law – the subject of traditional legal research – together with its external aspects.[15]

In this case, by studying a proposed business operation, the main legal questions to be addressed by business operators will be identified. This allows for exploration of the legal framework from the perspective of the individual confronted with it, which is helpful in identifying how current legislation facilitates or hampers developments on the ground.

[14] A Argyrou, 'Making the Case for Case Studies in Empirical Legal Research' [2017] Utrecht Law Review 95, p.p 96 and 97.

[15] Ibid, p. 97.

Therefore, a first stage of the thesis presents the proposed business operation in abstract (its technical steps independently of legal considerations). Once the key points have been identified, their solution is searched for in the relevant legislation, and any potential grey areas are mapped. Consequently, some parts of this thesis are of a descriptive nature. This is because description is a vital component of legal research, which serves as the basis for many of the other goals in legal research (such as comparison, analysis, or evaluation).[16]

This mapping of uncertainties and how they affect the business proposal is key for the third purpose of this thesis, namely to provide recommendations for improvement of the legal framework. The analysis of uncertainties reaches beyond the law itself, as the nature of law and legal research calls for support from other disciplines when analyzing the "interactions between law and external phenomena".[17]

When addressing internal aspects of the law, legal dogmatics will be used, understood as a set of claims and arguments about the content and meaning of norms, their legal effects, and their validity. Legal dogmatics is about how the law is, rather than how it should be.[18]

In practical terms, the approach adopted involves engaging with several types of sources.

Given that one of the central components of the approach is the mapping of EU legislation as applied to a particular product and business operation, secondary EU law is the backbone of the analysis. Specifically, the provisions of directives on waste, on batteries and on end-of-life vehicles (ELVs) are central.

Complementarily, case-law of the Court of Justice of the European Union and European Commission guidance will also be analyzed, given their role in interpreting and clarifying legislation. In relation to these interpretative sources, it must be noted that case-law by the Court is binding upon all parties, whereas Commission guidance is only the Commission's interpretation, and is not a binding

[16] L Kestemont, *Handbook on Legal Methodology: From Objective to Method* (Intersentia 2018).
[17] E.L Rubin, 'Law and and the methodology of the law' [1997] Wisconsin Law Review 521, p. 541.
[18] A Peczenik, 'Empirical Foundations of Legal Dogmatics' [1969] Logique et Analyse 32, p. 34.

source. Rather, it serves the purpose of, for instance, bringing together different provisions and case-law to provide a unified overview of where the legal framework stands at any given point.

The text of directives allows for certain generalizations to be made with respects to legal outcomes in all EU countries. However, their indirect nature calls for caution in two main respects.

First, while generalizations can be made to some extent on the basis of directives (for instance where they establish definitions for widely-used concepts), there is also potential for divergence between national legal systems. These may concern spaces where directives leave it to the discretion of Member States to regulate certain aspects (explicitly or by remaining silent on the topic), or where they use concepts that are open to interpretation.

The second caveat flows from this diverging nature of the national transposition of directives. Assumptions about how the provisions of a directive will play out in practice – or that any given provision has legal force – must be made with caution.

To address these difficulties, national legislation will also be analyzed insofar it applies or operationalizes the obligations laid out in directives. In this case, given that the idea for the thesis was first put forward by a Swedish company, the national-level analysis will focus on Sweden.

Finally, one of the broader goals of the thesis is to assess to what extent applicable law is appropriate in light of objectives set out in policy documents. Therefore, in addition to the binding types of sources outlined above, non-binding sources will also be included in the analysis (mostly European Commission communications).

1.4 Scope and limitations

The topic of this thesis relates to many potential fields of law. Due to time and space constraints, it is necessary to limit its scope to some specific areas.

Given that this thesis' purpose is to relate the current legislative framework on the reuse of EVBs to the new environmental policies of the EU, we limit ourselves to

the areas of the law related to the battery and its (re)usability *vis-à-vis* public authorities. Said areas of law include waste legislation (the Waste Framework Directive, the End-of-life Vehicles Directive, and the Batteries Directive), product legislation (the Batteries Directive), and legislation on chemicals (the REACH Regulation).

Therefore, three areas of importance to the business model fall outside the scope of this work.

First, Intellectual Property aspects, while central to the practical implementation of the business model, are not addressed separately. From a battery's contents (which can influence the type of waste or the conditions for market access after repurposing) to the software that allows to monitor a battery's health state, Intellectual Property will need to be addressed by specific operators. However, it concerns the (re)usability of the battery *vis-à-vis* private parties, and therefore falls out of the scope of this thesis.

Emerging legislation on batteries at EU level (the proposal on a Batteries Regulation currently under negotiation) addresses some of these questions. Its relevant provisions will be presented when examining how it seeks to tackle any potential shortcomings.

A second important caveat is that the thesis doesn't address legislation regarding electricity markets. Operators storing energy often do it for the purpose of participating in the market, and therefore this pillar of regulation is also central. However, it is not concerned with the battery but with its use, and falls outside of our scope.

The final point to be taken into account is that the legislation included in the thesis is static – it concerns batteries "as they are" rather than "as how they should be". The question of how to design batteries – and any given product, for that matter – for better environmental impacts (including reusability) is a crucial one in current legislative debates. The current proposal for an Ecodesign Regulation expanding on and replacing the current Ecodesign Directive is proof of that. Nevertheless, legislative timelines are long, and the business model analyzed here concerns batteries that have already been in use for a period of time. Both of these factors

mean that evolutions in ecodesign are unlikely to be relevant for operators in the short term.

Although not a scope delimitation, a final word of caution is needed. Most of the legislation involved in this thesis consists of European Directives. Therefore, it is sometimes necessary to include the national legislation transposing them. Given that the business model is inspired on a Swedish company, national legislation will be that of Sweden, in which the author doesn't have a background.

1.5 Structure

To address its subject matter, the thesis proceeds in several sections. First, the following section outlines the business model (the technical operation proposed), and points at some pieces of legislation that might seem to be relevant at first sight. Section 3 then lays out the content of said pieces of legislation. Section 4 addresses the core of the research questions. Returning to the business proposal in light of the knowledge on specific pieces of legislation, it identifies key questions in said business model, and illustrates the uncertainties under the current legislative framework. Section 5 follows the same structure as section 4, addressing the same business questions in light of proposed new legislation. Section 6 concludes.

2. Case-study: Battery repurposing for energy storage

2.1 Electric mobility as a key long-term trend

A quarter of greenhouse gas emissions in Europe in 2018 originated in the transport sector.[19] Therefore, to attain the European Union's new ambitious climate objectives, tackling transportation-related emissions is vital. In 2019, road transport represented the lion's share (72%) of all domestic and mobility-related emissions, and – although it's not a fast-growing mode of transportation such as international aviation – it's volume has remained stable since 1990.[20]

EU policy has sought to take this fact into account. The European Commission's Sustainable and Smart Mobility Strategy[21] has as one of its flagship actions "[b]oosting the uptake of zero-emission vehicles, renewable & low-carbon fuels and related infrastructure".[22]

In the case of road transport, this means having at least 30 million zero-emission vehicles in European roads by 2030, while, by 2050, "nearly all cars, vans, buses as well as new heavy-duty vehicles" should be zero-emission.[23] As of 2020, 11% of newly registered cars in the EU are electric vehicles (EVs), a stark increase from 2019, when the share was 3.5%.[24]

The Nordic countries are far ahead of the curve in terms of EV adoption. When taking into account the share of hybrid and fully electric vehicles in vehicle sales

[19] Eurostat, 'How are emissions of greenhouse gases in the EU evolving?' (*Eurostat*, n.d.) < https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-4a.html?lang=en > Accessed 26 May 2022.

[20] European Environment Agency, 'Greenhouse gas emissions from transport in Europe' (*European Environment Agency*, 18 November 2021) < https://www.eea.europa.eu/ims/greenhouse-gas-emissions-from-transport > Accessed 26 May 2022.

[21] European Commission, 'Sustainable and Smart Mobility Strategy – putting European transport on track for the future' (Communication) COM (2020) 789 final-

[22] Ibid, p. 3.

[23] Ibid, pp. 2 and 3.

[24] European Environment Agency, 'New registrations of electric vehicles in Europe' (*European Environment Agency*, 18 Noember 2021) < https://www.eea.europa.eu/ims/new-registrations-of-electric-vehicles > Accessed 26 May 2022.

for 2020, Norway (75%), Iceland (46%), Sweden (33%) are the three leaders among EEA/EFTA countries. Finland (19%) and Denmark (16%) are only surpassed by the Netherlands and Switzerland. Other important EV deployment leaders, in absolute terms, are Germany, France and Great Britain.

Beyond being already an established part of the market in Nordic countries, the deployment of EVs looks set to continue enjoying the spotlight. A 2021 Nordic Energy Research report found that electrification of road transport was key to reduce emissions, with almost full electrification of vehicles by 2050.[25] On the basis of this, it referred to the roll-out of charging infrastructure and the continued incentivization of electric vehicles as no-regret policy measures.[26]

2.2 Issues with electric mobility uptake

As the previous sub-section has shown, the future extension of EVs seems well established in both policy and market terms. However, despite its clear environmental benefits in terms of emissions abatement, electrification is not free of problems in itself. From sky-rocketing needs for the raw materials used in battery manufacturing[27] to the need to deploy charging infrastructure,[28] EVs come with their own range of policy issues. One of such developments is what to do with the rising number of batteries reaching the end of their useful life in EV applications (their "first life").

Due to the high performance requirements of EVBs, batteries no longer appropriate for use in mobility still retain between 70 and 80% of their nominal capacity.[29]

[25] Nordic Energy Research, 'Nordic Clean Energy Scenarios: Solutions for Carbon Neurality' (2021) < https://www.nordicenergy.org/publications/nordic-clean-energy-scenarios-solutions-for-carbon-neutrality/ > Accessed 26 May 2022, pp. 61 and 62.

[26] Ibid, p. 13.

[27] C Erickson, 'Raw materials in short supply for EV makers struggling to meet customer demand' (*S&P Global Market Intelligence*, 29 March 2022) < https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/raw-materials-in-short-supply-for-ev-makers-struggling-to-meet-customer-demand-69458070 > Accessed 26 May 2022.

[28] C Elfström, 'En ny laddstation var tjugonde minut – bilbranschens krav på Sverige för att klara klimatmålen' (*SVT*, 2 May 2022) < https://www.svt.se/nyheter/inrikes/en-ny-laddstation-var-tjugonde-minut-eu-s-krav-pa-sverige-for-att-klara-klimatmalen > Accessed 26 May 2022.

[29] M Shahjalal and others, 'A review on second-life of Li-ion batteries: prospects, challenges, and issues'[2022] Energy < https://www.sciencedirect.com/science/article/pii/S0360544221031303 > Accessed 26 May 2022; J Hagman, 'Second-life för elbilsbatterier – Applikationer, möjligheter och utmaningar' (*omEV*, 28 January 2022) < https://omev.se/2022/01/28/second-life-for-elbilsbatterier-applikationer-mojligheter-och-utmaningar/ > Accessed 26 May 2022.

Combined with rising numbers of EVs, this means that, in future years, growing numbers of batteries still fit for (some type of) use will become available. For the Nordic countries, it is estimated that the batteries placed on the market as of 2018 will reach the end of their first life starting in 2026, with about 100,000 batteries reaching this stage between 2030 and 2031.[30]

This poses the question of how to deal with these rising numbers of batteries, and how to capitalize on them to tackle other problems related to the deployment of EVs.

The Circular Economy Action Plan also signals the importance of batteries, which are identified as one of 7 key value chains on which specific policy and legislative action will be focused.[31]

2.3 Battery repurposing for energy storage: business model

One of the potential applications for waste EVBs is repurposing for energy storage, where the batteries are adapted for a different use as was initially envisaged (in this case, energy storage). Such an application has the potential to deliver two key environmental benefits. First, it extends the batteries' useful life. Second, it can support the electrification of the economy by making it possible to shift and transport electricity produced from time-bound renewable energy sources.[32] This sub-section will present a simplified view of the technical steps to be performed in the business model, independently of the regulatory framework. Following sections will return to this schematic depiction, expanding on the applicable regulations and on how they become relevant.

The business model can be simplified as below.

[30] L Dahllöf, M Romare and A Wu, 'Mapping of lithium-ion batteriees for vehicles: A study of their fate in the Noridc countries' (Nordic Council of Ministers 2019) < https://www.norden.org/en/publication/mapping-lithium-ion-batteries-vehicles > Accessed 26 May 2022, p. 28.

[31] Circular Economy Action Plan (n7), p. 7.

[32] E Elkind, 'Reuse and Repower: How to Save Money and Clean the Grid with Second-Life Electric Vehicle Batteries' (2014) < https://escholarship.org/uc/item/32s208mv > (Bank of America, Berkeley Center for Law, Energy & the Environment, and UCLA Emmett Institute on Climate Change and the Environment 2014) Accessed 26 May 2022.

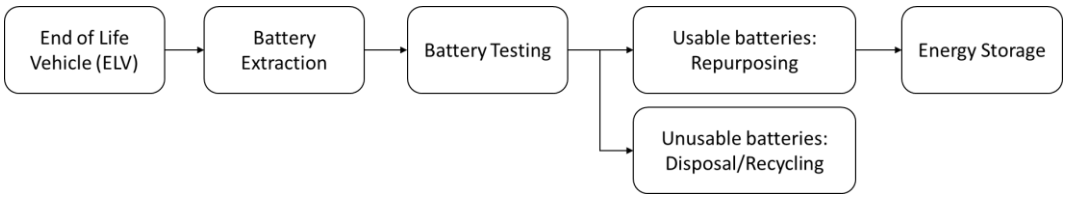

Figure 1 - Depiction of a "Repurposing for energy storage" business model

Both the specific operations involved in repurposing and the type and purpose of energy storage come in different forms and shapes. However, two key technical issues can be identified.[33]

A first important step is battery testing. Not all business operators have access to the battery management system, which would enable them to predict the battery's expected remaining lifetime on the basis of the specific battery's use history. This is because battery management systems present challenges in terms of Intellectual Property and data rights.[34] In the absence of such information, operators have to rely on more expensive and time-consuming testing of the battery.[35]

A second difficulty concerns the disassembly of the batteries. EVBs are in fact battery packs, which are composed of several modules, themselves made up of several cells. The chemical reactions making the storage of electricity possible happen at the cell level.[36] While in some cases direct reuse might be possible, in others it is necessary to disassemble the battery packs to different extents.[37] Relatedly, where batteries are sourced from different providers, compatibility issues may arise, as batteries can have different designs.[38]

---

[33] L Albertsen and others, 'Circular business models for electric vehicle lithium-ion batteries: An analysis of current practices of vehicle manufacturers and policies in the EU' [2021] < https://www.sciencedirect.com/science/article/pii/S0921344921002676 > Accessed 26 May 2022, pp. 5 and 6

[34] As mentioned in section 1.4, these fall out of the scope of this thesis. Therefore, the conditions under which different actors might access or share information and access to the system will not be examined in depth. However, section 5 touches upon some proposed changes that would create a right for acquirers of second-hand batteries to access such information.

[35] L Albertsen (n33), pp. 5 and 6.

[36] European Commission, 'Future Brief: Towards the battery of the future' (2018) <https://ec.europa.eu/environment/integration/research/newsalert/pdf/towards_the_battery_of_the_future_FB20_en.pdf> Accessed 26 May 2022.

[37] L Albertsen and others (n33), pp. 5 and 6.

[38] J Hagman (n29).

2.4 Relevant legislation

In order to assess how the current legislative framework hampers or facilitates the business model – the second purpose of this thesis – it is first necessary to establish what said legislative framework consists of.

A central piece of the legal framework is the product-specific legislation. Currently, batteries are regulated in the EU through Directive 2006/66/EC, on batteries and accumulators and waste batteries and accumulators.[39]

A second group of pieces of legislation concerns the products within which batteries are embedded. In the case of EVBs, this concerns vehicles, the disposal of which is regulated under Directive 2000/53/EC, on end-of-life vehicles.[40] To ensure that no important rules are left out, legislation on Electrical and Electronic Equipment (EEE) will also be included as part of the potential legal framework. This concerns two Directives. Directive 2011/65/EU, on the restriction of the use of certain hazardous substances in electrical and electronic equipment, concerns the design and production stages of EEE.[41] Directive 2012/19/EU, on waste electrical and electronic equipment (WEEE), concerns its waste stage.[42]

Third, most of the Directives above relate to waste in some way. The Batteries Directive contains some provisions on the waste stage and management of batteries, and both the ELV and WEEE Directives concern waste directly. As will be explained below, Directive 2008/98, on waste,[43] is the framework piece of legislation for waste law, and contains some overarching rules on the interplay between waste and product legislation. Therefore, it is also included in the analysis.

---

[39] Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC [2006] OJ L266/1 (Batteries Directive).

[40] Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles [2000] OJ L269/34 (ELV Directive).

[41] Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment [2011] OJ L174/88 (RoHS Directive).

[42] Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE) [2012] OJ L197/38 (WEEE Directive).

[43] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives [2008] OJ L312/3 (Waste Framework Directive).

Finally, as will be explained below, it is also important to analyze the product legislation for batteries, as waste batteries being reused must comply with it. This obviously concerns the Batteries Directive, but also Regulation (EC) 1907/2006, concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and establishing a European Chemicals Agency.[44] The use of some substances in batteries might be restricted under the REACH Restriction regime.

Figure 2 below shows the business model again, with a preliminary representation of how the different pieces of legislation relate to it.

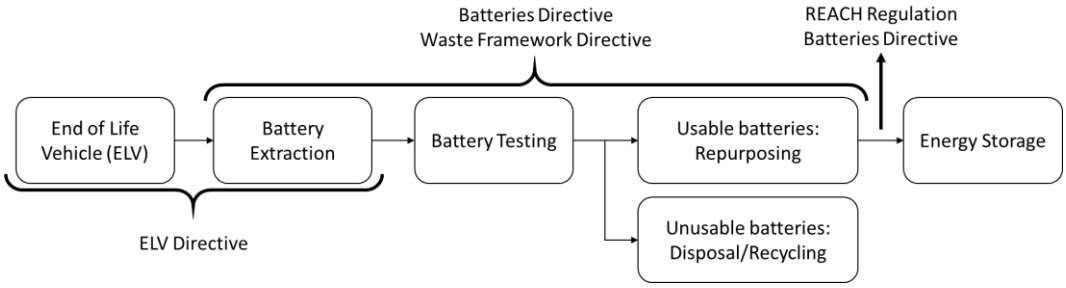

Figure 2 - Depiction of a "Repurposing for energy storage" business model, with key legislation

[44] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC [2006] OJ L396/1 (REACH Regulation).

3. Overview of key legislation

This section will describe the key existing pieces of legislation outlined at the end of the previous section. For Directives, the main pieces of implementing legislation in Sweden will be included.

3.1 The Waste Framework Directive

Directive 2008/98/EC, on waste and repealing certain Directives (the Waste Framework Directive), is the overarching piece of legislation for waste management within the EU. The framing character of the Directive has been established by the Court, which has found that it doesn't apply where it is in conflict with more specific pieces of legislation on waste, but that it is applicable insofar specific legislation is silent.[45]

Adopted on the basis of Article 175(1) of the Treaty Establishing the European Community (currently article 192 TFEU, on the Environment), its aims are the protection of human health and the environment through the reduction of waste and its impacts. It also has important objectives in terms of boosting more efficient resource use and reducing its impacts.[46]

Following reviewing obligations under the original Directive,[47] Directive (EU) 2018/851 expanded and modified several of its provisions.

In what follows, except where otherwise stated, references to the Waste Framework Directive relate to the version currently in force, following its 2018 amendments.

[45] C Backes (n10), pp. 329 and 330.

[46] Waste Framework Directive, Article 31.

[47] Ibid, Article 37 (original).

3.1.1 Definition of waste under the WFD

The WFD sets the definition of waste that is used by other pieces of legislation relative to both waste and the environment. This renders the definition of waste under the WFD crucial, as it defines the scope of application of waste-specific legislation, and influences obligations under environmental law.[48]

Article 3(1) establishes a seemingly simple definition of waste as "any substance or object which the holder discards or intends or is required to discard".[49] When applying the definition to any given situation, two main parameters would seem subject to most change.

In the first place, what constitutes "discarding" is of direct relevance to the definition of waste. However, despite the central place of discarding in EU waste legislation, it is not defined. The definition of waste management in Article 3(9), which includes recovery or disposal operations, can provide an initial approximation. Any substance or object destined for recovery or disposal will likely be waste. However, the recovery and disposal operations listed in Annexes I and II are non-exhaustive.[50] Therefore, a substance or object destined for operations different to those listed in Annexes I and II might still be waste.

Secondly, as made clear by the second theoretical situation in Article 3(1) – a substance or object that the holder intends to discard – the determination of who the holder is is important. Article 3(6) defines the waste holder as the person in possession of the waste.

3.1.2 The Waste Hierarchy

Article 4 of the WFD introduces a "Waste Hierarchy" to orient waste management policy. The Union and its Member States must apply the following waste management options to waste streams in a priority order:

- Prevention

[48] European Commission, 'Guidelines on the interpretation of key provisions of Directive 2008/98/EC on waste' (2012) < https://ec.europa.eu/environment/pdf/waste/framework/guidance_doc.pdf > Accessed 26 May 2022 (Commission WFD Guidelines), Point 1.1.1.

[49] Waste Framework Directive, Article 3(1).

[50] Ibid, Articles 3(15) and 3(19) *in fine*.

- Preparing for reuse
- Recycling
- Other recovery
- Disposal

Preparing for reuse, recycling and other recovery form a joint category of recovery, which is mutually exclusive from disposal.[51] Prevention is, strictly speaking, not a waste management option, as it concerns substances and objects *before* they become waste.[52] Annexes I and II contain non-exhaustive lists of disposal and recovery operations, respectively.

Reuse is defined in Article 3(13) as "any operation by which products or components that are not waste are used again for the same purpose for which they were conceived".

Given that reuse relates to products and components "that are not waste", its mirror waste management option is preparation for reuse. It is defined in Article 3(16) as "checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be reused without any other pre-processing".

Therefore, the determination of the product's purpose is crucial to the classification of its recovery as reuse (and of the preliminary recovery operation as preparation for reuse).

Recycling, on the other hand, is defined in Article 3(17) as "any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes".

It is worth noting that, whereas the definition of reuse relates to "products or components", recycling refers to "materials".[53] Therefore, preparation of a product or component for a use different from the original purpose seems hard to classify under these categories.

[51] Commission WFD Guidelines, Point 1.4.5.

[52] Ibid, Point 1.4.2.

[53] Furthermore, it is worth noticing that none of these terms are explicitly defined.

The Directive retains a certain margin of maneuver for Member States when applying the Hierarchy. Given that the rationale behind the Hierarchy is to deliver the best environmental outcome, Member States may depart from it when regulating specific waste streams and on the basis of life-cycle thinking.[54]

3.1.3 Hazardous Waste and the European List of Waste

Hazardous Waste incurs additional obligations under Articles 17 to 19 of the Directive. The assessment of the hazardous nature of waste is to be done by referring to the criteria listed in Annex III ("Properties of waste which render it hazardous").[55]

To harmonize waste classification under this framework, Article 7 provides for a European "list of waste" to be adopted by the Commission through delegated acts. Commission Decision 2000/532/EC establishes a European list of wastes. Its most recent revision took place in 2014.[56]

The Swedish Waste Ordinance[57] introduces the list of waste into the Swedish legal system.[58]

3.1.4 End of waste under the WFD

In addition to governing how substances and objects might become waste, the WFD also regulates how and when waste ceases to be so (and, therefore, when waste legislation ceases to apply to it).

Article 6 of the Directive addresses the so-called "end-of waste" (EoW), by providing that Member States must ensure that any waste ceases to be so if:[59]

- It has undergone a recycling or recovery operation, and
- It fulfills the following four conditions

[54] Waste Framework Directive, Article 6(2).

[55] Ibid, Article 3(2).

[56] Commission Decision 2014/955/EU of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council [2014] OJ L 370/44.

[57] Avfallsförordning (2020:614).

[58] Ibid, 1c. 4§.

[59] For an analysis of the content and rationale of each criterion, see T Turunen (n13), pp. 194 to 198.

- It is to be used for specific purposes
- A market or demand for the substance or object in question exists
- It fulfills appropriate technical requirements and fulfills applicable legislation
- Its use will not lead to overall adverse environmental or human health impacts

In Sweden, Law 2020:601, reforming the Environmental Code,[60] introduced three new paragraphs in Chapter 15 (Waste), under the rubric "When waste ceases to be waste". Paragraph 9a introduces the EoW criteria as contained in the EU Directive into Swedish law.[61]

However the criteria are not to be generally applied by private actors to any specific waste. Rather, they serve as the basis for public authorities (at the national or European levels) to draft detailed criteria for specific streams. At the European level, one Council Regulation[62] and two Commission Regulations[63] have established EoW criteria for iron, steel and aluminium scrap; glass cullet; and copper scrap, respectively.

Where no specific end of waste criteria have been developed at the national or EU levels, Member States may make a case-by-case determination of EoW in line with the conditions outlined above.[64] In Sweden, no such system exists. The determination of EoW in the absence of detailed criteria is for the waste handler to make.[65]

Regarding hazardous waste, the Court of Justice clarified in *Lapin* that the condition that the use of recovered waste will not lead to adverse environmental or human health impacts can not be interpreted to mean that hazardous waste can never be recovered. Such a determination must be done on a case-by-case basis and relative

[60] Lag (2020:601) om ändring i miljöbalken.

[61] Miljöbalk (1998:808), 15c. 9a§.

[62] Council Regulation (EU) 333/2011, establishing criteria determining when certain types of scrap metal cease to be waste under Directive 2008/98/EC [2011] OJ L94/2.

[63] Commission Regulation (EU) 1179/2012, establishing criteria determining when glass cullet ceases to be waste under Directive 2008/98/EC [2012] OJ L337/31; Commission Regulation (EU) 715/2013, establishing criteria determining when copper scrap ceases to be waste under Directive 2008/98/EC [2013] OJ L201/14.

[64] Waste Framework Directive, Article 6(4).

[65] Naturvårdsverket, 'När avfall upphör att vara avfall' (n.d.) < https://www.naturvardsverket.se/vagledning-och-stod/avfall/nar-avfall-upphor-att-vara-avfall/ > Accessed 26 May 2022. Other countries, however, have full-fledged case-by-case determination systems, such as Ireland, see Environmental Protection Agency, 'End of Waste' (n.d.) < https://www.epa.ie/our-services/licensing/waste/end-of-waste-art-28/ > Accessed 26 May 2022.

to the properties of the recovered substance or object.[66] In relation to this, the extent to which the applicable product legislation – which is also a stand-alone requirement – provides for the protection of the environment and human health will be important.[67]

The obligation to ensure that the post-waste product fulfills product and chemical legislation falls on the market placer (the person placing it on the market for the first time).[68] Where the product is not placed on the market, such a responsibility shall fall on the first user.[69]

3.1.5 Other provisions

Additionally, the WFD establishes a common framework for extended producer responsibility (EPR) measures. The original provision in the 2008 Directive was limited in its ambition; it only enabled Member States to establish EPR and did not go in detail into how EPR schemes should look like.[70] The 2018 review introduced a new Article 8a containing minimum requirements that EPR schemes must follow. Therefore, while – in general terms – the decision to establish an EPR scheme continues to lie with the Member States, there is some level of harmonization as to how said schemes look.[71]

Additionally, Article 8(4) provides that EPR applies "without prejudice to the responsibility for waste management as provided for in Article 15(1) and without prejudice to existing waste stream specific and product specific legislation."[72] Therefore, when assessing the responsibility for any given waste, product-specific legislation must be studied, supplemented – insofar as it is silent – by the provisions on waste management responsibility in the WFD.

---

[66] Case C-358/11 *Lapin elinkeino-, liikenne- ja ympäristökeskuksen liikenne ja infrastruktuuri -vastuualue v Lapin luonnonsuojelupiiri ry* [2013] ECLI:EU:C:2013:142 (*Lapin*), paras. 59 and 60.

[67] Commission WFD Guidelines, Point 1.3.2.

[68] Waste Framework Directive, Article 6(5)(b).

[69] Ibid, Article 6(5)(a).

[70] Ibid, Article 8 (original).

[71] Ibid, Article 8(1), third subparagraph.

[72] Ibid, Article 8(4).

3.2 The Batteries Directive

Directive 2006/66/EC, on batteries and accumulators and waste batteries and accumulators (the Batteries Directive) is the main piece of European legislation concerning batteries. It contains provisions regarding the content of the batteries, their market placement, and their waste management.[73]

In what relates to the regulation of waste batteries, it seeks to promote their recycling and supplement EU waste legislation.[74] Therefore, the provisions of the WFD continue to apply.

The Directive classifies batteries and accumulators into three main groups: automotive batteries, industrial batteries, and portable batteries. All batteries can be composed of one or more cells (therefore, stand-alone cells and modules are both comprised within the definition).[75]

Automotive batteries are used in the starting, lighting or ignition of vehicles.[76] Industrial batteries are used for industrial and professional uses, and for electric vehicles.[77] Finally, portable batteries are those batteries that are neither industrial nor automotive, and that are sealed and can be hand-carried.[78]

Battery packs are "any set of batteries [⋯] that are connected together and/or encapsulated within an outer casing [⋯] that the end-user is not intended to split up or open".[79]

Although the definition of battery packs is the one that fits best with EVBs, it only becomes relevant for labelling purposes (see Article 21 of the Batteries Directive). For all other provisions, the adequate category of analysis is that of industrial batteries.

[73] Batteries Directive, Article 1.
[74] Ibid, Article 1(2).
[75] Ibid, Article 3(1).
[76] Ibid, Article 3(5).
[77] Ibid, Article 3(6).
[78] Ibid, Article 3(3).
[79] Ibid, Article 3(2).

3.2.1 Waste Management under the Batteries Directive

Waste batteries are simply defined, as anticipated above, as batteries that are waste under the provisions of the WFD.[80]

The Batteries Directive establishes recycling as the main waste management approach for batteries. In addition to the reference to recycling as an overarching objective contained in Article 7, Article 13 sets obligations on Member States to encourage and support the development of recycling and treatment technologies.

The definition of recycling under the Batteries Directive aligns with the one under the WFD.[81] Another additional important definition is that of "treatment", which includes all activities carried out in a facility for sorting, preparation for recycling or preparation for disposal.[82]

The Directive bans the disposal through landfilling or incineration of industrial and automotive batteries that have become waste without carrying out prior treatment and recycling.[83]

As can be seen from the provisions above, the focus is on recycling within the meaning of the WFD, which renders the situation of (preparing for) reuse unclear in legal terms.

Ordinance 2008:834, on producer responsibility for batteries,[84] is the Directive's main transposition instrument regarding batteries. It introduces the classification of batteries under the Directive into Swedish law, and sets up an EPR scheme for batteries in the Swedish market.

3.3 The End-of-life Vehicles (ELV) Directive

Given that the goal is to use EVBs and that these might become available due to the vehicle within which they are embedded reaching the end of its useful life, it is

[80] Ibid, Article 3(7), read in the light of the repeal and transitional provisions of the Waste Framework Directive.
[81] Cf. Batteries Directive , Article 3(8) and Waste Framework Directive, Article 3(17).
[82] Batteries Directive, Article 3(10).
[83] Waste Framework Directive, Article 14.
[84] Förordning (2008:834) om producentansvar för batterier.

important to understand the framework governing waste vehicles in the European Union.

Directive 2000/53/EC, on end-of life vehicles (the ELV Directive) governs waste arising from vehicles with the goals of preventing waste, promoting recovery of vehicles and their components, and improving the car industry's environmental performance.[85] Therefore, it applies to end-of-life vehicles and their components and materials,[86] which would include EVBs.

3.3.1 Waste Management under the ELV Directive

As in the case of the Batteries Directive, the ELV Directive defines end-of-life vehicles as vehicles that are waste within the meaning of the Waste Framework Directive.[87]

In what comes to waste prevention, the ELV's approach is more nuanced than the one under the Batteries Directive. Whereas Member States must encourage vehicle producers to increase the use of recycled materials in vehicle manufacturing,[88] the importance of design for ease of reuse and recovery is also stressed.[89]

Articles 5 and 6 establish obligations relative to the collection and treatment of vehicles that have reached their end of life. Provisions under Article 5 relate mostly to the conditions to be fulfilled by take-back systems. Article 6 establishes the conditions to be fulfilled by treatment operators.

Article 7 sets reuse and recovery targets for vehicles,[90] and places an obligation on Member States to "encourage the reuse of components which are suitable for reuse, the recovery of components which cannot be reused and the giving of preference to recycling when environmentally viable [⋯]".[91]

[85] ELV Directive, Article 1.
[86] Ibid,, Article 3(1).
[87] Ibid, Article 2(1) of the ELV Directive, read in the light of the repeal and transitional provisions of the WFD.
[88] Ibid, Article 4(1)(c).
[89] Ibid, Article 4(1(b).
[90] Ibid, Article 7(2).
[91] Ibid, Article 7(1).

Given that the definitions of reuse and recycling are the same as under the WFD and the Batteries Directive, the caveats made above on how to classify the use of EVBs for energy storage are also present here. Also, the formulation of Article 7(1) gives no clarity on any potential priority conflict between reuse and recycling.

Ordinance 2007:185, on producer responsibility for cars,[92] sets up an EPR scheme for ELVs in the Swedish market.

3.4 Waste from Electric and Electronic Equipment (WEEE) Directive

Another key piece of legislation on waste containing batteries is Directive 2012/19/EU, on waste electrical and electronic equipment (the WEEE Directive).

Although batteries are central to many of the devices covered by the WEEE Directive, they are not Electric and Electronic Equipment (EEE) themselves. Annexes I to IV of the Directive, which list EEE categories and examples for each of them, do not mention batteries, and the only references to batteries in the legislation are requirements that they are removed from separately collected WEEE.[93]

Therefore, the waste stage of Batteries is governed through the product-specific provisions of the Batteries Directive.

3.5 Restriction of Hazardous Substances (RoHS) Directive

Directive 2011/65/EU, on the restriction of the use of certain hazardous substances in electrical and electronic equipment, could be relevant insofar as the end of waste criteria require fulfilling applicable product and chemical legislation.

Annex I of the Directive lists the categories of EEE that fall within its scope. It contains 10 specific categories – none of which relate to batteries – and one catch-

[92] Förordning (2007:185) om producentansvar för bilar.

[93] WEEE Directive, Annex VII, Point 1 and Annex VIII, Point 2.

all category ("other EEE not covered by any of the categories above"). However, in light of what has been said above on the scope of the WEEE Directive, batteries would seem to fall out of the scope of the RoHS Directive.

This is also consistent with the fact that the Batteries Directive contains equivalent restrictions on hazardous substances in Batteries.[94]

3.6 Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation

The REACH Regulation is the main piece of legislation of the European Union on chemical substances. It contains provisions on the use of all substances at all stages of their life cycle,[95] and has the twin objectives of "ensur[ing] a high level of protection of human health and he environment" and "[ensuring] the free circulation of substances on the internal market while enhancing competitiveness and innovation".[96]

Upon its entry into force, the REACH Regulation established a change of paradigm from administrative-led chemicals management and control towards an enhanced role and responsibility for market participants.[97] As Article 1(3) establishes, the REACH system "is based on the principle that it is for manufacturers, importers an downstream users to ensure that they manufacture, place on the market or use such substances that do not adversely affect human health or the environment".[98]

To advance towards this vision, the REACH Regulation lays down – as its name indicates – 4 main regulatory regimes: Registration, Evaluation, Authorisation and Restriction.

Under the Registration regime, economic operators placing chemical substances in the European market must register said substances. Registration involves the

[94] Batteries Directive, Article 4.

[95] D Bourguignon, *EU policy and legislation on chemicals. Overview, with a focus on REACH* (European Parliament Research Service 2019), p. 9.

[96] REACH Regulation, Article 1(1).

[97] M Führ and J Schenten, 'Industrial Chemicals in the Regulatory Laboratory: Self-responsibility and Inclusive Governance' in M Peeters and M Eliantionio (eds), *Research Handbook on EU Environmental Law* (Edward Elgar Publishing 2020), pp. 347 to 349.

[98] REACH Regulation, Article 1(3).

generation and submission of data on the properties and risks of the substance, as well as proving adequate risk-management measures. The extensiveness of the information required varies with the amount of substance (tonnage) placed in the market.[99]

The Evaluation regime concerns two distinct procedures. On one side, the European Chemicals Agency (ECHA) reviews the contents of the submitted registrations to ensure that they comply with the Regulation's requirements.[100] It must also approve testing proposals, given that one of the objectives of the regulation is to minimize testing on vertebrate animals. [101]

In addition to the evaluation of registration dossiers, the Evaluation regime also concerns the evaluation of registered substances (a process coordinated by ECHA and involving Competent Authorities in the Member States). In addition to the power to require substance registerers to submit further information, [102] the substance evaluation may lead to the substance being placed under the Authorisation or Restriction regimes[103] or being subject to harmonised classification and labelling (initially under Title XI of the regulation, and now replaced by the equivalent provisions of Regulation 1272/2008, on classification, labelling and packaging of substances and mixtures).[104]

Under the Authorisation regime, substances deemed to be "substances of very high concern"[105] can't be placed on the market unless an authorization is granted first or an exemption from the requirement to obtain an authorization is established.[106] The overall objective of the Authorisation regime is to control the risks arising from substances of very high concern while ensuring that they are progressively replaced

[99] M Führ and J Schenten (n97), p. 350; D Bourguignon (n95), pp. 10 to 12.

[100] M Führ and J Schenten (n97), p. 352.

[101] D Bourguignon (n95), p. 14.

[102] REACH Regulation, Article 46.

[103] Ibid, Articles 48, 59(3) and 69(4).

[104] Ibid, Article 4 and Article 115(1). The latter has now been replaced by Title V of Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 [2008] OJ L353/1, through Article 57(5) and (7) therein.

[105] REACH Regulation, Article 55.

[106] Ibid, Articles 56(1)(a) and (b).

by economically and technically viable alternatives.[107] Substances under the Authorisation regime are listed in Annex XIV of the Regulation.

The fourth and final regime (Restriction) provides that Union authorities can prohibit or impose conditions on specific substances, either in an overarching manner or for specific uses – in what may be described as "general risk-mitigating measures".[108] While the Authorisation regime addresses specific substances – although the possibility for use-specific exemptions exists – the Restriction regime regulates their uses.[109] Substances under the Restriction Regime are listed in Annex XVII of the Regulation, which includes information on the restriction's conditions.

Although the REACH Regulation concerns chemical substances, it is relevant to the case at hand for two related reasons: obligations directly arising from REACH and the effects of REACH on the business model.

3.6.1 Obligations under REACH

In the first place, despite the overall focus on substances by themselves, REACH contains some provisions on substances in articles too. Article 3(3) defines articles as objects whose function is determined by their "shape, surface or design [⋯] to a greater degree than [their] chemical composition".[110]

Article 7, on the registration and notification of substances in articles, establishes obligations in two cases.

First, articles containing substances intended to be released under normal or reasonably foreseeable conditions of use must be registered when present in the articles in quantities of above 1 ton per year per producer or importer.[111]

[107] Ibid, Article 55.
[108] M Führ and J Schenten (n97), p. 354.
[109] D Bourguignon (n95), pp. 20 and 21.
[110] REACH Regulation, Article 3(3).
[111] Ibid, Article 7(1).

Second, producers or importers must notify ECHA of substances of very high concern present in articles in concentrations of above 0.1% weight by weight. This requirement also has a 1 ton per year threshold.[112]

Article 3(4) defines "producers" as "any natural or legal person who makes or assembles and article within the community". Given that, as explained in section 2 of this Thesis, the business model will likely involve some level of (re)assembly of the repurposed batteries, the economic operators would seem to fall under this definition.

As explained above, one of the requirements of the EoW criteria under the WFD is that the waste ceasing to be waste "fulfills the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products".[113]

In addition to establishing that such a responsibility falls on the person placing on the market or using for the first time the after-waste product, Article 6(5) of the WFD also explicitly speaks of ensuring that the product "meets relevant requirements under the applicable *chemical* and product-related legislation" [emphasis added].[114]

Therefore, it seems established that businesses collecting and repurposing batteries would come under the scope of the REACH regulation (independently of whether they incur obligations under it).

3.6.2 Effects of REACH for the business model

In addition to direct obligations under REACH, the effects of the evolving nature of the system that the regulation establishes must also be taken into account.

The Batteries Directive contains some prohibitions on the use of specific substances in batteries (namely mercury and cadmium).[115] Another heavy metal that is singled

[112] Ibid, Article 7(2).
[113] Waste Framework Directive, Article 6(1)(c).
[114] Ibid, Article 6(5).
[115] Batteries Directive, Article 4.

out in the Directive is lead, which is subject – together with mercury and cadmium – to specific labelling obligations.[116]

However, given that the REACH regulation evolves, battery repurposers can't assume that batteries are still compliant once they have finished their first life. In the meantime, authorisation or restriction requirements might have kicked in. Lead is a case in point, as ECHA has proposed its inclusion without exemptions under the Authorisation regime.[117]

[116] Ibid, Article 21(3).

[117] Although, given that that authorisation relates to manufacturers, importers, or downstream users of substances, it isn't obvious that, in this specific case, the business would be affected.

4. Key questions relating to the business model

As the previous sections have hinted at, there are several important points to take into account when examining a repurposing for energy storage business model under the current legislative framework. Figure 3 below reproduces the business model representation from section 2, introducing some key points that will be analyzed in the current section.

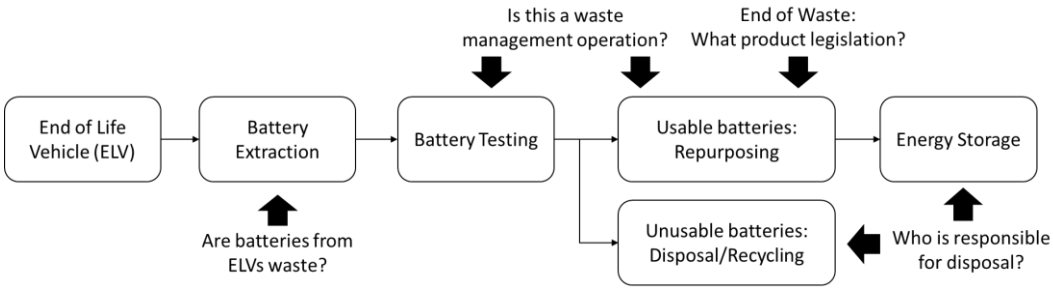

Figure 3 - Key legal questions for a "Repurposing for energy storage" business model

To approach these questions, this section will proceed as follows. First, the nature of the batteries obtained from ELVs will be examined, assessing whether – and, if so, under what conditions – used or returned batteries are waste.

The two following questions build on a hypothetical scenario: assuming that batteries are waste, is the repurposing process a waste management operation, and what product legislation obligations should repurposers take into account?

A final question concerns the disposal of the batteries unfit for repurposing or having exhausted their useful life in the second application. Given that the Batteries and Waste Framework Directives contain provisions on waste management and (producer) responsibility, it is important to examine who is responsible for the disposal of said batteries. Although the determination of whether batteries are waste isn't determinant for this point – batteries will have to be disposed of regardless – it may influence who responsibility for the batteries is allocated to.

4.1 Is the classification of batteries as waste automatic?

As explained in section 3, waste is simply defined as a product or substance that its holder discards, intends to discard, or is required to discard. However, no definition of discarding is provided.

In the first place, we need to determine who the holder is in this case. As has already been said, the holder is "the waste producer or the natural or legal person who is in possession of the waste".[118] Although "waste producer" is not defined in the WFD, its use in specific Articles suggests an intuitive reading in the direction of it being the person whose activities directly produce the waste. For instance, Article 8a (containing minimum requirements for EPR schemes) separates the producer of the product from waste producers.[119]

4.1.1 EVBs as waste relative to individual consumers

A first possibility is to regard individual owners as the holders of the product (the car and the battery inside of it) that are to become waste. Here, when delivering the car at the end of its useful life, consumers would be seen as discarding or intending to discard it. From here on, the collection systems organized under the ELV Directive would be waste management operations, and the ELV and its components (including the battery) would be waste.

Such an interpretation could be based on some provisions of the ELV Directive. Article 5(1) speaks about collection systems for ELVs and waste parts removed during repair operations. In addition to the link between ELVs and waste in this provision, ELVs themselves are defined as vehicles being waste withing the meaning of the WFD.[120]

Even if one where to argue that EVBs are not components of the vehicle within the meaning of the ELV Directive (but rather stand-alone products regulated by their

[118] Waste Framework Directive, Article 3(6).
[119] Ibid, Article 8a(4).
[120] ELV Directive, Article 2(2).

specific regulation) the same logic applies in relation to the collection schemes under the Batteries Directive. Article 8 calls for collection schemes for *waste* batteries.

The Swedish transposition of both Directives reflects this rationale. Section 3 of Ordinance 2007:185, on producer responsibility for cars, mandates producers to accept end-of-life cars, which section 2 defines as cars being waste. Section 14 of Ordinance 2008:834, on producer responsibility for batteries, replicates the same structure.

Therefore, at first sight and on the basis of the ELV and Batteries Directives, returned batteries would seem to be waste.

4.1.2 Beyond the letter of the law: case-law

However, it might be possible to argue – at least in the interest of exploring the scenario where batteries are not (yet) waste – the possibility that, while all waste batteries must be taken back by producers, not all the batteries they take back are necessarily waste.

Joined Cases C-418/97 and C-419/97, *ARCO Chemie*, illustrate the approach the Court of Justice has to waste.[121] The case concerned the use of what is now regulated as by-products,[122] which were being exported for energy incineration by producers (which could be regarded as a recovery operation).

The Court started by asserting that, given that the objectives of waste legislation are the protection of human health and the environment, the concept of waste cannot be interpreted restrictively.[123]

However, the fact that a product undergoes a recovery operation is not a sufficient basis, in itself, to find that product to be waste.[124] This is because what is

[121] C Backes (n10), p. 338.

[122] Substances or objects that result from a production process but are not its primary objective, if they fulfill some conditions. For more details, see Waste Framework Directive, Article 5.

[123] Joined Cases C-418/97 and C-419/97 *ARCO Chemie Nederland Ltd v Minister van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer (C-418/97) and Vereniging Dorpsbelang Hees, Stichting Werkgroep Weurt+ and Vereniging Stedelijk Leefmilieu Nijmegen v Directeur van de dienst Milieu en Water van de provincie Gelderland (C-419/97)* [2000] ECLI:EU:C:2000:318 (*ARCO*), paras. 34 to 40.

[124] Ibid, paras. 49 to 51.

determinant is the intention of the holder in *discarding* said product.[125] Moreover, this would seem to be a case-by-case determination on the basis of the specific holder's intention, as the fact that something is commonly regarded as waste "is irrelevant in view of the express definition of waste".[126]

As regards the commercial value of the potentially discarded objects, its importance is also unclear to some extent. Early case-law established that waste doesn't exclude substances capable of economic reutilization.[127] Accordingly, a substance or object may be waste even where the holder does *not* intend to exclude economic reutilization.[128]

Indeed, despite what has been stated above, the Court limited, in *Shell*, the conditions under which the holder's intention to reuse a product might prevent it from becoming waste. Whereas "it would not be justified" to make such products subject to waste legislation, this "should be confined to situations in which the reuse of the goods or substance in question is not a mere possibility but a certainty [⋯], without the necessity of using any of the waste recovery processes [⋯]".[129]

The degree of certainty of any potential reuse is therefore a key point. On one hand, if reuse carries a financial advantage for the holder, this is an indication that reuse is more likely.[130] On the other hand, the Court's reasoning in *Shell* in the paragraphs above would seem to exclude circumstances where recovery operations have to be performed. As has been explained, "recovery" under the WFD means "any operation" leading to waste replacing other materials, or being prepared for doing so.[131] Preparation for reuse is a subset of recovery operations.[132]

In addition to the inherent value of the waste being irrelevant (in cases where its reutilization is uncertain), the fact that a price is paid for a substance or object –

[125] Ibid, par. 64.

[126] Ibid, par. 71. Although it is evidence that the holder indeed intended to discard it, as per par. 73.

[127] Joined Cases C-206/88 and C-207/88 *Criminal proceedings against G. Vessoso and G. Zanetti* [1990] ECLI:EU:C:1990:145 (*Vessoso and Zanetti*), paras. 8 and 9.

[128] Ibid, par. 13.

[129] Joined Cases C-241/12 and C-242/12 *Shell Nederland Verkoopmaatschappij BV and Belgian Shell NV* [2013] ECLI:EU:C:2013:821 (*Shell),* par. 53.

[130] Case C-624/17 *Openbaar Ministerie v Tronex BV* [2019] ECLI:EU:C:2019:564 (*Tronex*), par. 23.

[131] Waste Framework Directive, Article 3(15).

[132] Ibid, Article 3(16).

hence, that the product's holder is making money out of the transaction – is also irrelevant.[133]

The Court's case-law on the concept of waste would therefore also point to returned batteries being waste rather than products. As the preceding paragraphs have outlined, the economic value of the batteries is of little substance when assessing their status as (non-)waste, as would be paying consumers for their used batteries. Additionally, the fact that a recovery operation is needed further reduces the certainty that the overall flow of used batteries will be used.

4.1.3 Changing the holder: battery leasing

The two preceding sub-sections have illustrated that, from the perspective of the individual consumer as holder of the battery, the return of the battery tends to mark its passage into waste status.

Another possible angle is to find ways to consider that – in passing the battery to the battery collection facility – the consumer is not discarding it. Essentially, this would displace the consideration of the consumer as the holder whose intention to discard is relevant to determine whether a product is waste. As repurposers – the new holder under this approach – have a clear interest in reusing the batteries, their intention would not be to discard them (and the batteries would therefore not be waste).

In relation to a product holder's intentions and the nature of the holder, the *Shell* case is of interest. A Belgian client of Shell returned a fuel shipment that did not meet contractual specifications. The Court found that, in returning the fuel, the Belgian client was *not* automatically discarding it, given that it was seeking to obtain a refund.[134]

In this case, the fact that the return was made in the context of a contract and with the expectation of a refund seems to be important in the Court reaching this point. However, it provides some further backing for its conclusion. Notably, the fact that

[133] *Tronex*, par. 28.

[134] *Shell*, par. 46.

"the risk that the holder [the Belgian client] will discard that consignment in a way likely to harm the environment is low" must be taken into account, especially where "the substance or object concerned has a significant commercial value".[135]

In *Tronex,* the Court extended the same reasoning to cover returns of products by individual consumers under the product guarantee.[136] The similarities of the practical situation in *Tronex* with the situation at hand make it worth to examine it in detail.

A Dutch company, Tronex BV, was charged with shipping waste illegally after sending a shipment of returned and unsold appliances (some of which were defective) to Tanzania without following the provisions of Regulation 1013/2006, on shipments of waste.[137] The Dutch prosecution argued that, in those circumstances, the products could not be sold under normal conditions, and therefore Tronex was seeking to discard them.[138] Tronex, on the other hand, argued that the products were not waste, given that they were selling rather than discarding them.[139] The Dutch court decided to refer the case to the Court of Justice.

The Court operated a distinction between different parts of the shipment. Unsold appliances – which were unopened in their original packaging – were found to be regular products, as they did not represent a burden for the holder (Tronex).[140] However, while consumers were not discarding a product upon returning it into the guarantee, returned products could not be assumed to be reusable to the necessary degree of certainty.[141] Specifically, appliances requiring repair and which can not therefore be used for their original purpose are waste, given that they are a burden for their holder.[142] This is irrespective of the cost of the repair,[143] as it makes the reuse of said products uncertain.[144]

---

[135] Ibid.
[136] *Tronex* (n130), par. 34.
[137] Ibid, par. 10.
[138] Ibid, par. 11.
[139] Ibid, par. 12.
[140] Ibid par. 32.
[141] Ibid, paras. 34 to 36.
[142] Ibid, par. 35.
[143] Ibid, par. 37.
[144] Ibid, par. 38.

To shed this assumption that the malfunctioning products are not waste, the holders must demonstrate that reuse is certain, and that the necessary inspections or repairs have been carried out.[145]

Therefore, the determination of whether the substance was waste must be done in relation to Shell/Tronex, and not their clients. This determination must be made in light of the WFD's objective of ensuring that waste management won't endanger human health or the environment.[146]

Two main caveats emerge from the case-law above in relation to any potential use of batteries returned through EPR schemes.

The first caveat concerns the type of relationship under which the return takes place. Both *Shell* and *Tronex* refer to returns under a contract. This is determinant to the consideration that such a return is not a disposal within the meaning of the term in EU waste law.[147] The Court's statement in *Tronex* is particularly clear in that regard:

> "[A]s regards the electrical appliances returned under the product guarantee, it should be stated that goods that have undergone a return transaction carried out in accordance with a contractual term and in return for the reimbursement of the purchase price cannot be regarded as having been discarded. Where a consumer effects such a return of non-compliant goods with a view to obtaining a reimbursement of them under the guarantee associated with the sale contract of those goods, that consumer cannot be regarded as having wished to carry out a disposal or recovery operation of goods he had been intending to 'discard' within the meaning of Article 3(1) of Directive 2008/98"

Therefore, this displacement of the holder would need to be based on some type of contractual relationship (for instance a battery leasing scheme). However, even in such a case, two significant differences would remain relative to the case-law just examined. In the first place, returns under a sales contract are an exceptional situation, whereas returns under a fully fleshed out scheme would be the ordinary situation, and more akin to end-of-life management. Secondly, the fact that in the cases cited products were returned in exchange for reimbursement is another important difference (see for instance the long quote from *Tronex* above).

[145] Ibid, par. 40.

[146] *Shell* par. 48.

[147] *Tronex* par. 34; *Shell* par. 46.

A second caveat concerns the circumstances under which the products might be considered waste from the perspective of the new holder (Shell and Tronex in this case).

In the circumstances at hand, it is likely that battery repurposers receive a battery flow akin to that of the products in *Tronex*, where some of the batteries are reusable and some are not. However, such a judgment can not be made at first sight (as in the case of unsold goods in their original package, in *Tronex*), but would require some kind of testing and – potentially – repairing.

Under the WFD, "checking, cleaning or repairing" constitute preparation for reuse, which is a class of recovery operations.[148] Under *Shell*, as explained above, the need to perform a recovery operation would seem to prevent the certainty that the goods will be reused (which is the requisite for them not to become waste). Under *Tronex*, however, holders may prove that (potentially) malfunctioning products are not waste, if they can prove that reuse is certain and ensure that the necessary repairs have been done. [149]

The case-law of the Court seems to be somewhat contradictory. On the one hand, repair operations would seem to lead to the substance becoming waste (or, rather, would not allow it not to become waste). On the other hand, they are also a prerequisite for it *not* to become waste.

A possible interpretation is that, in *Tronex*, the Court was not setting out conditions under which the products did not become waste, but instead the circumstances under which they ceased to be waste (the end of waste). However, the reference to the certainty of reuse – which is the criteria for entry into the waste stage – would point in the opposite direction.

Therefore, also under the Court's development and clarification of waste law, batteries returned through EPR schemes would seem to be waste from the perspective of the receiver, given that their reuse is not certain – in fact, operations such as testing are needed to ensure that a second use is even possible.

[148] Waste Framework Directive, Article 3(16).

[149] *Tronex*, par. 40.

4.2 Completion of testing: is permitting needed?

Chapter IV of the WFD relates to permits and registrations, which apply to economic operators carrying out waste treatment (i.e. any of the disposal or recovery operations).[150] Therefore, given that the collected batteries would likely be considered to be waste, any testing, repair and reassembly would be a waste treatment operation.

Article 23(1) of the WFD establishes a general obligation for "any establishment or undertaking intending to carry out waste treatment to obtain a permit".

However, Article 24 authorizes Member States to exempt recovery operations from this requirement.[151] Exemptions take the form of general rules which make reference to the type, quantity and method of waste treatment within their scope.[152] In addition to the limited subset of waste management operations that can be exempted (i.e. only recovery operations or disposal of non-hazardous waste at the place of production), the possible extent of the exemptions themselves is also limited. Article 25(1), second sub-paragraph requires that exemptions are "in accordance with Article 13", which restates the requirement that waste management doesn't endanger human health or the environment.[153]

Additionally, the European Commission is empowered to adopt delegated acts setting out technical minimum standards where these would improve the protection of human health and the environment.[154]

Therefore, although it is clear that the repurposing operation is a waste treatment operation, it is necessary to refer to national legislation to determine whether permitting is necessary.

[150] Waste Framework Directive, Article 23(1) in conjunction with Article 3(14).

[151] Ibid, Article 24(b) WFD. Article 24(a) authorizes the same exemptions for the disposal of non-hazardous waste at the place of production.

[152] Ibid, Article 25(1).

[153] Ibid, Article 13.

[154] Ibid, Article 27.

Ordinance (2008:834), on producer responsibility for batteries, contains no specific provisions on permitting, given that it is only concerned with the obligations on producers to ensure that the batteries are collected.

Chapter 4 of the Waste Ordinance (2020:614)[155] contains obligations for waste management relative to some specific waste flows. The first waste flow addressed in the chapter is electrical and electronic products and batteries.[156] The only obligations on persons handling batteries consist of requirements on storage and on the process for battery disposal, but not on permits.[157]

Chapter 5 of the Waste Ordinance addresses permits and registration.[158] The transport of waste requires a special permit under certain conditions.[159] Where such a permit is not needed, the transport of hazardous waste must be notified.[160]

The Swedish Environmental Code empowers the government to provide for permitting requirements for environmentally hazardous activities.[161] The Environmental Assessment Ordinance (2013:251) lists out permitting and notification obligations for specific activities, on the basis of a three-level system (permit requirement A, permit requirement B, and notification requirement C).[162] Activities requiring a permit may not be undertaken until the permit has been secured.[163] Activities requiring notification can not be undertaken without being notified, but do not require a permit.[164]

[155] Avfallsförordning (2020:164), 4 c.

[156] The section contains some certification requirements for handlers of electrical and electronic waste, but the definition of electrical and electronic equipment doesn't include batteries. 1c. 13§ defines electrical waste by reference to Förordning (2014:1075) om producentansvar för elutrustning [Ordinance 2014:1075, on producer responsibility for electrical and electronic equipment], which defines (1c. 6§) electronical equipment as that that is used for the generation, transmission or measurement of electric current, or which is dependent on electric current to function properly (the same definition as in EU law).

[157] Avfallsförordning 4c. 4§.

[158] "Tillstånd och anmälan".

[159] Avfallsförodning 5c. 1§.

[160] Ibid, 5c. 7§ and following.

[161] Miljöbalk (1998:808), 9c. 6§.

[162] Miljöprövningsförordning (2013: 251) 1c. 6§ and 10§. The difference between "A" and "B" permits is the authority to which they are requested. "A" permits are requested from the land and environmental courts (mark- och miljödomstol), while "B" permits are requested from the country administrative board (länsstyrelse).

[163] Ibid, 1c. 3§.

[164] Ibid, 1c. 10§.

Chapter 29 of the Environmental Assessment Ordinance lists the permitting and notification requirements applying to waste-related activities.

The preparation of waste for reuse is subject to notification obligations, but doesn't require a permit.[165] In addition, waste storage is also subject to notification obligations if the stored waste weighs over 10 tonnes.[166] For the storage of hazardous waste, a "B" permit is necessary over 1 tonne;[167] under 1 tonne, notification might apply.[168]

In addition to whether testing would require a permit, it is also important to assess what specific operations should be carried out. As will be explained below, the market placers at the end of the waste stage are responsible for their product's compliance with the relevant legislation. However, the Batteries Directive does not require any specific testing.

This lack of clarity on what type of testing would be needed – or would be relevant in compliance terms – was recognized by the European Parliament, which called on the European Commission to develop guidelines for repurposing that addressed testing and safety.[169] Some provisions under the Batteries Regulation seek to address this gap (see, to this effect, section 5).

4.3 End of waste and applicable legislation

As has been explained above, one of the EoW status conditions is that the substance or object ceasing to be waste complies with the necessary technical requirements and legislation applicable to it as a product and for the purposes for which it will be used.[170]

---

[165] Ibid, 29c. 47§.

[166] Ibid, 29c. 49(2)§.

[167] Ibid, 29c. 50§.

[168] Ibid, 29c. 51(6)§.

[169] V Halleux, 'New EU regulatory framework for batteries: Setting sustainability requirements' (European Parliament Research Service, 2022) < https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2021)689337 > Accessed 26 May 2022, p. 5; European Parliament, 'A comprehensive European approach to energy storage`, resolution of 10 July 2020 P9_TA(2020)0198.

[170] Waste Framework Directive, Article 6(1). See especially Articles 6(1)(a) and (c).

Therefore, the applicable legislation at the end of a repurposing operation (of any product) depends to some extent on the use to which the repurposed batteries are put.

In the case at hand, this concerns two main points: legislation applicable to batteries as a product and legislation applicable to batteries in energy storage applications.

In relation to batteries as products, the Batteries Directive contains some requirements that determine their access to the market. Article 4 sets out prohibitions for batteries containing mercury and cadmium, while Article 21 establishes - together with Annex II – labelling obligations. There are, however, no other specific obligations.

The Directive is also silent on the use of batteries in energy storage applications (which is one of the gaps that the proposal for a Batteries Regulation seeks to bridge, as will be seen below). While some obligations might flow from other regimes, EU law on electricity markets did not include a definition of storage until 2019. In June 2019, the Parliament and Council repealed the two main instruments regulating electricity markets in the EU. Regulation (EC) 714/2009, on conditions for access to the network for cross-border exchanges in electricity, was repealed and replaced by Regulation (EU) 2019/943, on the internal market for electricity. Meanwhile, Directive 2009/72/EC, concerning common rules for the internal market in electricity, was replaced by Directive (EU) 2019/944, on common rules for the internal market for electricity.

While the provisions of the Regulation have been applied since January 1, 2020,[171] storage is defined and regulated mainly in the Directive, for which the transposition period extended until December 31, 2021.[172] Sweden is currently behind on the transposition, with the government's proposal currently going through Parliament.[173]

[171] Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity [2019] OJ L158/54, Article 71.

[172] Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU [2019] OJ L158/125, Article 71.

[173] Regeringskansliet, ' Genomförande av elmarknadsdirektivet när det gäller nätverksamhet' (28 December 2021) < https://www.regeringen.se/rattsliga-dokument/lagradsremiss/2021/12/genomforande-av-elmarknadsdirektivet-nar-det-galler-natverksamhet/ > Accessed 26 May 2022.

In addition to issues related to the batteries themselves when used in energy storage, the lack of specific provisions on energy storage itself also gave rise to regulatory issues, given that energy storage activities are considered production or consumption activities alternatively. This gave rise to problems of uncertainty and excessive economic burden.[174] A detailed examination of how the changes to electricity market legislation impact the business model falls – as established in sub-section 1.4 – out of the scope of this Thesis.

4.4 Lack of specific provisions on repurposing and reuse

In addition to the uncertainty arising from the definition of waste under EU law and from the applicable legislation at the end of waste stage, the terminology used by the Court and in the relevant legislation also pose some interesting questions.

In the first place, the case-law of the Court cited in previous sections refers to the *reuse* of articles.[175] Under EU legislation, reuse has a specific and limited meaning as "any operation by which products or components that are not waste are used again *for the same purpose* for which they were conceived" [emphasis added].[176] In connection with this, "preparing for reuse" (which is a waste management approach as opposed to reuse, which concerns products not having become waste) comprises "checking, cleaning or repairing" operations.[177]Although non-binding, the Commission Guidelines on the interpretation of the WFD provide some indication that this is to be understood in a restrictive way, as all examples concern the repair of products.[178]

[174] Groupe Renault, 'Innovation Deal: From E-mobility to Recycling – The Virtuous Loop of Electric Vehicle. Assessment of legal and regulatory barriers to the optimization of EV Battery Life Cycle' (2018) < https://www.renaultgroup.com/wp-content/uploads/2020/05/deliverable-1_evbatteries_innovation_deal_20181004.pdf > Accessed 26 May 2022 , pp. 29 to 33; D Tejada-Arango and others, 'A Review of Energy Storage System Legislation in the US and the European Union' [2019] Current Sustainable/Renewable Energy Reports 22.

[175] See, for example *Shell* par. 53, or *Tronex* pars. 23 and 24, and 35 to 40.

[176] Waste Framework Directive, Article 3(13).

[177] Ibid, Article 3(16).

[178] Commission WFD Guidelines (n48), Point 1.4.4

This opens the question of whether products can be prevented from becoming waste if they are going to be used for purposes other than those for which they were conceived (if they are not going to be reused, but used further).

While the case-law included in this thesis doesn't address this issue, an argument could be made that this should *not* be the case. This is because – where the second use is different to the first – compliance with the legislation relevant to the second use can not be assumed. Therefore, passage through the waste stage would serve to ensure said compliance with the third EoW criterion.[179]

This is a further argument for batteries used in the business model being waste. However, it is not a barrier to the use of said batteries – once they have gone through the waste stage – for energy storage purposes.

Nevertheless, the emphasis the Batteries Directive places on recycling as waste management go-to option could (in combination with the Waste Hierarchy contained in the WFD) have that effect.

As explained above (see sub-section 3.2.1), the Batteries Directive seeks to promote the recycling of batteries, which it defines as "the reprocessing in a production process of waste materials for their original purpose or for other purposes, but excluding energy recovery"[180] – essentially the same definition as under the WFD.[181] The Commission's WFD Guidelines seek to clarify the definition of recycling:

> The common idea behind recycling is that a waste material is processed in order to alter its physico-chemical properties allowing it to be used again for the same or other applications. [⋯] Recycling includes any physical, chemical or biological treatment leading to a material which is no longer a waste.[182]

While no definition of "materials" or "products" is provided in either the Batteries Directive or the WFD, having two different terms would indicate that they are not

[179] Waste Framework Directive, Article 6(1)(c): "Member States shall take appropriate measures to ensure that waste which has undergone a recycling or other recovery operation is considered to have ceased to be waste if it complies with the following conditions [⋯] (c) the substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products".

[180] Batteries Directive, Article 3(8).

[181] Waste Framework Directive, Article 2(17): "[A] any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations".

[182] Commission WFD Guidelines, Point 1.4.6.

the same. This is supported by the text of the law itself; for instance, when defining prevention, the WFD talks about "measures taken before a substance, material *or* product has become waste" [emphasis added].[183] Intuitively, a finished battery would be a product rather than a material.

Thus, repairing a product would not seem to fall under the definition of recycling (which only concerns materials).

Throughout the Directive's substantive provisions, recycling is often referred to in combination with treatment (for instance in Article 12, titled "Treatment and recycling").[184] Treatment is defined as "any activity carried out on waste batteries and accumulators *after they have been handed over* to a facility for *sorting, preparation for recycling or preparation for disposal*" [emphasis added].[185]

Therefore, the waste management approach underlying the Directive seems to be a simple collection-treatment-recycling-disposal one,[186] where recycling essentially means taking the battery apart and reusing its raw materials (either for manufacturing a new battery or in new products).

The above paragraphs show that much hinges on what the purpose of the EVB is understood to be. If understood restrictively - as a battery for the purpose of moving an EV – the repurposing operation would *not* constitute reuse. A broader understanding could be that the purpose of a battery is to store electricity, irrespective of what said electricity is used for. Following this broader definition would allow the repurposing operation to be considered reuse under the WFD.

The current categorization of batteries under the Batteries Directive could serve as a basis for this more favourable interpretation. Currently, batteries are separated into three groups. Automotive batteries are defined on the basis of their specific purpose of providing starting power for vehicles.[187] A second specific group concerns portable batteries, which define themselves by being sealed and small

[183] Waste Framework Directive, Article 3(12).

[184] Additionally, Article 14 provides that only batteries having undergone both can be disposed of; Article 15 addresses both together in relation to exports; and Article 16 in relation to financing. Additionally, Annex III contains requirements on treatment and recycling (all Articles for the Batteries Directive).

[185] Batteries Directive, Article 3(10).

[186] As seen, for instance, from Recitals 14 to 21.

[187] Batteries Directive, Article 3(5).

enough to be carried by hand.[188] The portable batteries category is further restricted by the fact it only includes batteries not belonging to other groups.[189]

Hence, most batteries fall under the third group, which addresses industrial batteries.[190] On the basis of this, it may be argued that the repurposing operation is not changing the use of the battery, which will continue to be an industrial one. This lack of distinctions among industrial batteries is further reinforced by the fact that the Directive's provisions applicable to industrial batteries address them as a homogeneous group.

On the other hand, the definition of industrial batteries contains a degree of differentiation, given that it defines them as those batteries "for exclusively industrial or professional uses *or* used in any type of electric vehicle" [emphasis added].[191] In the same vein, it could be argued that, given that reuse is defined in the WFD as use for the same purpose as a product was *conceived*, the design stage of the product is the relevant one, rather than the categorization under the Batteries Directive.

In sum, the clear categorization of the repurposing operation as a preparation for reuse seems unlikely.

A further complication emerges when considering the Waste Hierarchy under the WFD.

In the first place, the repurposing of the battery cannot be prevention (given that prevention is only relevant for non-waste, and the collected batteries are highly likely to be waste).[192]

In the light of what has just been said on reuse, there is a chance that the operation could not be considered as preparation for reuse either.

Given that it isn't recycling or disposal either, it must be classified under "other recovery".

[188] Ibid, Articles 3(3)(a) and (b).
[189] Ibid, Article 3(3)(c).
[190] Ibid, Article 3(6).
[191] Ibid, Article 3(6).
[192] Waste Framework Directive, Article 3(12).

However, "other recovery" comes only *after* recycling in the Hierarchy as set out in Article 4(1) of the Directive. In this context, it would be hard to argue – on the basis of the Hierarchy – that repurposing must take precedence over the recycling provisions of the Batteries Directive.[193]

Furthermore, even if the repurposing operation were clearly established to be a preparation for reuse (therefore above recycling in the Hierarchy), it must be noted that the Hierarchy doesn't apply in all circumstances. Article 4(2) of the WFD allows Member States to depart from it "to encourage the options that deliver the best overall environmental outcome". While no mention to a "best environmental outcome" is made in the Batteries Directive – which predates the WFD and therefore the Waste Hierarchy – its environmental objectives[194] seem to point in that direction.

4.5 Responsibility for the EVB

Both the Batteries and ELV Directives foresee the funding and establishment of take-back systems for the products within their scope (including specific requirements on the systems' functioning).[195]

Under the ELV Directive, economic operators must ultimately be responsible for establishing these systems[196] (economic operators being an umbrella term for all parties involved for a profit in a vehicle's life cycle).[197] The Batteries Directive, on the other hand, contains no obligations as to who must be involved in the development of collection systems. However, it enables Member States to require producers to establish the schemes, whereas other economic operators would

[193] The legal strength of the Waste Hierarchy *vis-à-vis* EU or national law – which would essentially be the main thread of such a line of argumentation – is a topic in itself, which falls outside the scope of this work. As of 2020, the Court had not been asked to pronounce itself on the issue. For a brief analysis of the effects ot the Hierarchy, refer to C Backes (n10), pp. 334 and 334.

[194] Batteries Directive, Article 1. See also Recitals 5, 12 and 17.

[195] Ibid, Article 8; ELV Directive, Article 5.

[196] ELV Directive, Article 5(1).

[197] Ibid, Article 2(10): "[P]roducers, distributors, collectors, motor vehicle insurance companies, dismantlers, shredders, recoverers, recyclers and other treatment operators of end-of life vehicles, including their components and materials".

participate.[198] Producers are also responsible for financing collection and treatment,[199] and must be registered as such.[200]

Under the Batteries Directive, a producer is the first person placing batteries – including batteries incorporated in products – in a Member State and on a professional basis.[201] Within the provisions on collection of the Batteries Directive, it is established that Member States must ensure that producers of industrial batteries (the batteries used in electric vehicles) do not refuse to take back waste batteries from end-users "regardless of chemical composition and origin".[202] End-users are not defined in the directive.

Therefore, responsibility for the batteries must be ascertained in relation to these two EPR systems (the ELV EPR system being more relevant at the beginning of the business model, and the one for batteries being more relevant for batteries discarded during the repurposing and at the end of their second life).

Ordinance (2007:185), on producer responsibility for cars, transposes the parts of the ELV Directive concerning producer responsibility.

Section 3 establishes an obligation for car producers (i.e. manufacturers in Sweden or importers into Sweden) to take back the cars they have placed on the market without compensation – or any car for which no other producer is responsible.[203] However, this obligation can be deemed as fulfilled if producers ensure that suitable takeback systems (as defined in Section 4) are established.[204]

Sections 6 and 10 establish the mechanisms to ensure that reuse and recycling targets under EU law are fulfilled. The main measure is the provision of information by the manufacturers on the materials, components and hazardous substances present in cars.[205]

[198] Batteries Directive, Article 8(2).
[199] Ibid, Article 16.
[200] Ibid, Article 17.
[201] Ibid, Article 3(12).
[202] Ibid, Article 8(3).
[203] Förordning (2007:185) om producentansvar för bilar, 3§ in relation to 2b§.
[204] Ibid, 3§ (third paragraph) and 4§.
[205] Ibid, 10§, in relation to 6§.

In Sweden, most major producers fulfill their EPR obligations through participation in BilRetur, a takeback system managed by BIL Sweden (the industry's organization).[206]

The fact that EVBs are collected together with electric ELVs poses two types of questions. In the first case, there is the fact that often the economic operator actually taking the car in is a scrapper (for instance, BilRetur is essentially a platform for finding certified scrappers). Under Ordinance (2007:186), on car scrapping,[207] electric vehicle batteries are one of the car's components that have to be taken out of the car before any other treatment can be performed.[208]

However, regulation on what the scrappers do with said components is light. As per the Ordinance, scrappers should work towards the aims for reuse and recycling under Ordinance (2007:185), on producer responsibility for cars, "to the extent that it is reasonable with regard to the scrapper's conditions to influence the reuse and recycling of ELVs".[209]

In this context, repurposers would need to collect the batteries from the individual scrappers, which entails financial investment and human resources, in addition to potential additional obligations in terms of – for instance – waste collection and transport.

A possible alternative would be for carmakers to collect used cars themselves, which would allow them to build a critical mass of collected EVBs. However, it is unclear whether the system set up for this would need to live up to the standards for suitable collection systems under the Ordinance on producer's responsibility for cars,[210] or whether these could be deemed to continue to be fulfilled through parallel participation in national systems.

Ordinance (2008:834) establishes an EPR system for batteries in Sweden. To place batteries on the market, producers must be registered before the Swedish

[206] BilRetur, 'BilRetur – Bilproducenternas nätverk' (n.d.) <https://bilretur.se/bilretur-bilproducenternas-natverk/ > Accessed 26 May 2022.

[207] Bilskrotningsförordning (2007:186).

[208] Ibid, 26§.

[209] Ibid, 34§. "I den mån det är skäligt med hänsyn till bilskrotarens förutsättningar att påverka återanvändningen och återvinningen av uttjänta bilar".

[210] Förordning (2007:185) om producentansvar för bilar, 4§.

Environmental Protection Agency (Naturvårdsverket).[211] As in the case of cars, importers of batteries are also considered producers.[212]

The same approach is taken as with EPR for cars. Although battery producers have an obligation to take back batteries they place in the market,[213] they can fulfill this obligation by ensuring that suitable collection systems are in place.[214] Such a responsibility extends to ensuring that waste treatment is environmentally acceptable.[215] For embedded batteries (such as EVBs), collection can take place through the take-back schemes for the product in which they are embedded.[216]

Currently, neither the Batteries Directive nor the Swedish Ordinance implementing EPR for batteries mention second-life batteries. This creates some uncertainty over the (second) life-cycle obligations for repurposers. On the one hand, both the Directive and the Ordinance define producers as those placing batteries on the market *for the first time* [emphasis added].[217] If interpreted restrictively, repurposers would *not* be considered producers. In those circumstances, they would not bear additional obligations and could avail themselves of the take-back systems in place.

However, a broader interpretation is also possible. Under the WFD, the person responsible for the EoW compliance with product legislation is the person "plac[ing] a material on the market *for the first time* after it has ceased to be waste" [emphasis added].[218] This status is akin to that of producers, who bear responsibility for the compliance of products they place on the market. In these circumstances, it is unclear whether the obligations to support take-back systems would also apply to repurposers.

Irrespective of the above, repurposers would clearly be responsible for repurposed batteries that they repurpose and place for the first time in a Member State. This

[211] Förordning (2008:834) om producentansvar för batterier, 12§.

[212] Ibid, 3§.

[213] Ibid, 14§.

[214] Ibid, 16§.

[215] Ibid, 20§.

[216] Ibid, 19§ *in fine.*

[217] Ibid, 3§.

[218] Waste Framework Directive, Article 6(5)(b) WFD. Where the product is not placed on the market, the responsibility falls on the person using it for the first time, as per Article 6(5)(a).

could concern situations where export follows repurposing, or where repurposers source used batteries in Member States other than their own.

5. The European Commission's proposal for a Batteries Regulation

On 10 December, 2020, the European Commission presented a proposal for a regulation on batteries and waste batteries, which would replace the current Batteries Directive. After both Parliament[219] and the Council[220] adopted their negotiating positions in March 2022, inter-institutional negotiations are currently underway.

As hinted by the choice of a regulation over a directive, this new instrument seeks to be much more comprehensive and address all stages of the life-cycle of batteries in a comprehensive way. It is aligned with the EU's renewed environmental ambitions, and concerns the sustainability of battery production, the circularity of their waste management, and the lack of a level playing field within the Union.[221]

Indeed, while the current Batteries Directive spans 30 Articles and 3 Annexes over 14 pages, the proposed Regulation contains 79 Articles and XIV Annexes, being 109 pages long. This is because, in addition to updating the provisions of the Directive, it adds new features to the EU regulatory framework on batteries – such as product conformity assessment procedures, market surveillance, and performance and durability requirements.[222]

[219] European Parliament, 'Batteries and waste batteries. Amendments adopted by the European Parliament on 10 March 2022 on the proposal for a regulation of the European Parliament and of the Council concerning batteries and waste batteries, repealing Directive 2006/66/EC and amending Regulation (EU)' P9_TA(2022)0077.

[220] Council of the EU, 'Sustainable batteries: member states ready to start negotiations with Parliament' (17 March 2022) <https://www.consilium.europa.eu/en/press/press-releases/2022/03/17/sustainable-batteries-member-states-ready-to-start-negotiations-with-parliament/> Accessed 26 May 2022.

[221] European Commission, ' Proposal for a regulation of the European Parliament and of the Council concerning batteries and waste batteries repealing Directive 2006/66/EC and amending Regulation (EU) 2019/1020' (Communication) COM (2020) 798 final (Batteries Regulation Proposal).

[222] See, respectively, Articles 15 to 20, 66 to 69, and 9 and10 of the Batteries Regulation Proposal.

A detailed examination of the changes to be brought by the Batteries Regulation falls outside the scope of this thesis. However, this section will examine how it addresses (or not) the key uncertainties identified in section 2.

5.1 Classification of used batteries as waste

The principles governing the passage of batteries into waste are the same as under the Batteries Directive. As with Article 3(7) of the Directive, Article 2(39) of the Regulation defines waste batteries by reference to the Waste Framework Directive. Therefore, the uncertainties around and arising from the classification of batteries as waste would still be present under the new framework.

If anything, Article 59, titled "Requirements related to the repurposing and remanufacturing of industrial batteries and electric-vehicle batteries", reinforces the interpretation that batteries undergoing repurposing operations are to be considered waste. Paragraph 4 of that article establishes the responsibility of repurposers for the compliance of the repurposed battery with the applicable product, environmental and health legislation, as well as with technical standards.[223] This is akin to the third EoW criterion in the WFD.[224]

In the same vein, Article 59(5) establishes the evidence that repurposers must be able to provide in order to prove that "a waste battery, subject to a repurposing or remanufacturing operation, is no longer waste [⋯]".[225] Although a literal reading of the provision might allow the conclusion that not all batteries subject to repurposing are waste – and that only those that are need to comply with these particular requirements – a reading in relation to the uncertainty over the classification of used batteries would call for the opposite conclusion.

[223] Batteries Reguation Proposal, Article 59(4).

[224] Waste Framework Directive, Article 6(1)(c): "Member States shall take appropriate measures to ensure that waste which has undergone a recycling or other recovery operation is considered to have ceased to be waste if it complies with the following conditions [⋯] the substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products [⋯]".

[225] Batteries Regulation Proposal, Article 59(5).

5.2 Testing as a waste treatment operation

Given the above, testing and repairing operations would also be waste treatment operations, and would need to comply with the applicable legislation as outlined in Section 4.2 of this thesis.

However, the proposal provides for some measures that could diminish barriers in this part of the business model.

Article 14 requires rechargeable batteries above a certain capacity – 2 kWh, well under EVBs nowadays[226] – to have battery management systems that provide information on a battery's state of health and expected lifetime.[227] Interestingly, Article 14(2) establishes a right for purchasers of used batteries to access such data in order to, among others, evaluate its capability for further use and facilitate repurposing.[228]

Furthermore, Article 60, on end-of-life information, mandates producers to make available to waste management operators information on safety measures necessary for the collection and storage of waste batteries.[229] Paragraph 3 in the same Article requires producers to make available – upon request and for each battery model – information on safety measures concerning transport, treatment and recycling of waste batteries.[230]

While these provisions might be irrelevant where repurposing is carried out by or in partnership with the producers, they strengthen the position of independent repurposers.

[226] Electric Vehicle Database, 'Useable battery capacity of full electric vehicles' (n.d.) <https://ev-database.org/cheatsheet/useable-battery-capacity-electric-car > Accessed 26 May 2022.

[227] Batteries Regulation Proposal, Article 14(1). Annex VII therein details the parameters to be used for this assessment.

[228] Ibid, Articles 14(1)(a) and (b).

[229] Ibid, Article 60(2).

[230] Ibid, Article 60(3)(b).

5.3 End of waste: applicable legislation

One of the key uncertainties for repurposing is that, as explained in section 3.1.4, the application of the EoW is not homogeneous. While in some cases European or national legislation can clarify what conditions must be fulfilled and what legislation applies to the new product, this is not always the case.

Article 59 of the proposed regulation establishes some conditions governing the re-entry of waste into the product stage. While these are not EoW criteria "proper" (i.e. adopted as Commission Regulations under the WFD), they serve the same purpose.

As explained in section 5.1, repurposers are responsible for the compliance of batteries that they put back in the market. This compliance does not extend to some of the more stringent requirements set out under the new Regulation for batteries put in the market before they become applicable.[231]

However, it is unclear how these will impact repurposers for batteries after that time. For instance, Article 8 establishes minimum levels of recycled contents for new batteries in relation to some specific raw materials, and Article 39 requires operators placing batteries on the market to have supply chain due diligence policies. In the long run, complying with these provisions could prove a considerable burden for repurposers.

5.4 Lack of provisions on repurposing and reuse

Another one of the key uncertainties identified in the business model is the lack of legal provisions addressing repurposing. In this respect, the Batteries Regulation represents an important step forward relative to the Directive.

Article 2(26) establishes a definition for repurposing as "any operation that results in parts or the complete battery being used for a different purpose or application

[231] As per second sub-paragraph of Article 59(4) of the Batteries Regulation Proposal, obligations relative to carbon footprint calculation of the battery, recycled content requirements, performance and durability requirements, and supply chain due diligence will not apply iff a repurposer proves that the battery was first placed on the market before they became applicable. However, this means that they *will* apply for batteries not fulfilling those conditions. It is unclear whether the repurposer can fulfill these obligations by reference to the first market placer's activities.

than the one that the battery was originally designed for."[232] This contrasts with reuse, which is defined as "the complete or partial direct reuse of the battery for the original purpose the battery was designed for".[233]

The Batteries Directive does not define either of the terms. Therefore, while reuse could be understood through the definition of the term in the WFD, there was no guidance on repurposing (which is not mentioned in the WFD at all). Both the adaptation of the term "reuse" to the specific context of batteries and the definition of repurposing bridge the important gap of how to classify an operation where the second life of a product entails different purposes relative to its original design.

In line with this distinction between reuse and repurposing on the basis of the initial purpose of the battery, the Regulation creates a new class of electric vehicle batteries, which are those batteries "specifically designed to provide traction to hybrid and electric vehicles for road transport".[234] This would end the bundling of electric vehicle batteries and industrial batteries under the current Directive. The definition of industrial batteries in the Regulation also clarifies their role as a fall-back category.[235]

Under the Directive, as explored in section 4.4, the merging of EVBs with industrial batteries provided a potential way out for the requirement that reuse must be *for the same purpose*. While the Regulation would make it harder to argue that separate classes of batteries are designed for the same purposes – especially given that both definitions make reference to design being a factor in classifying batteries[236] – it sets out a specific path for repurposing to take place.

In relation to the repurposing of batteries, Article 59 – as explained in previous sections – provides for access to battery management systems, and assigns the responsibility for safety and compliance to the repurposer.[237]

---

[232] Batteries Regulation Proposal, Article 2(26) Batteries Regulation.

[233] Ibid, Article 2(40).

[234] Ibid, Article 2(12).

[235] Ibid, Article 2(11): "'[I]ndustrial battery' means any battery designed for industrial uses *and any other battery* excluding portable batteries, electric vehicle batteries and automotive batteries" [emphasis added].

[236] As with EVBs, which are defined as batteries *specifically designed* to provide traction in Article 2(11) of the proposal.

[237] See especially Batteries Regulation Proposal, Articles 59(2) and (3).

Article 59(5) provides some clarity on what type of proof must be given for the EoW status – and therefore, implicitly, for what conditions must be fulfilled. In addition to testing for the battery's health[238] and proof that further use is ensured (for instance through a contract for sale),[239] evidence of protection against damage during transport must be provided.[240] The responsibility to prove this lies with the battery holder,[241] but it involves repurposers themselves (for instance through the documentation of testing performed during the repurposing).

Additionally, Article 12 of the Regulation proposal addresses the safety of stationary battery energy systems, establishing a general requirement to have technical documentation demonstrating that they are safe. Testing for a series of safety parameters must be proven.[242]

5.5 Responsibility for the EVBs

The Batteries Directive sets out general requirements for Member States to establish EPR schemes ensuring the responsibility of producers with respect to the collection and treatment of batteries.[243] However, beyond the general minimum requirements for EPR schemes under the WFD,[244] it leaves Member States significant leeway to define the specifics of the systems they establish.

Given that changing the legal instrument from a directive to a regulation would upload the legislation to the European level, the Regulation contains much more extensive provisions on EPR – essentially establishing an EU-wide EPR system for batteries. The responsibility of producers extends (inter alia) to organizing the separate collection of waste batteries and their subsequent repurposing, remanufacturing, treatment or recycling.[245]

[238] Ibid, Article 59(5)(a).

[239] Ibid, Article 59(5)(b).

[240] Ibid, Article 59(5)(c).

[241] Ibid, Article 59(5).

[242] Ibid, Article 12(1). Annex V therein lists out the specific safety parameters and general guidance on the tests to be performed for each of them.

[243] Batteries Directive, Articles 8, 12 and 16.

[244] Waste Framework Directive, Article 8a.

[245] Batteries Regulation Proposal, Article 47(1)(a).

This would provide a firmer legal basis for repurposing activities, given that the equivalent Article in the Batteries Directive only refers to treatment and recycling. In addition to providing a clearer signal that repurposing is an acceptable waste management approach, it provides some reassurance to producers that organizations performing repurposing are an acceptable way to fulfill their obligations. Producer responsibility organizations may be authorized by a national competent authority under Article 47(6) of the Regulation.

Furthermore, the Regulation would also harmonize the situation of embedded batteries. Under Article 52 therein, operators of waste treatment facilities for ELVs must hand EVBs over to producers or producer responsibility organizations.[246]

All in all, the regulation clarifies responsibility for batteries relative to the current legal framework, which is sparser at EU level and has potential for important national divergence.

[246] Ibid, Article 52.

6. Conclusions

The purpose of this thesis has been to describe and analyze the current legislative framework applicable to a proposed business operation (battery repurposing for energy storage). After this initial descriptive/analytic stage, a second purpose was to assess the relation between the business model and the legislative framework, and to pinpoint specific areas for improvement.

In this respect, research questions 1 to 3 have been the driving thread of the previous sections. In light of the letter of the law and of the examined case-law, the best working assumption seems to be that used EVBs are indeed waste. This is because the definition and development of the notion of waste are expansive, leading to a very high threshold for apparently discarded products to avoid becoming waste (that they must be certain to be reused without the need for a waste recovery process, so that products needing repair are waste).

The classification of used batteries as waste triggers waste management obligations, which depend mostly on national legislation. In Sweden, testing of batteries would seem to mostly be subject to notification obligations.

Being able to use waste batteries in a second life requires fulfilling the EoW criteria, an assessment made by the repurposers. However, the lack of product-specific criteria – in relation to EoW, to safety, or to energy storage – is a major source of uncertainty in this regard. Proposed changes to EU batteries legislation would tackle some of these shortcomings.

Another important source of uncertainty is the responsibility for batteries over their life-cycle. While legislation exists that sets out the obligations of producers relative to ELVs and used batteries, it does not explicitly mention second product lives. If adopted, the Commission's proposal for a Batteries Regulation could harmonize legislation on these aspects.

The remainder of this sixth and final section will focus on research question 4, which addresses the thesis' findings in light of the business model and of the EU's ambition to boost the uptake of circular economy.

A crucial point for the business model – and for circular economy business models in general – is the qualification as waste of their input substances and products. However, as the previous sections have shown, this often remains an important source of uncertainty. This indeterminacy then spills over to the applicable obligations and the duty-holders, given that these aspects are partly determined by reference to their status as waste or non-waste.

In the case at hand, the proposed Batteries Regulation would seem to clarify the status of batteries for repurposing as waste.[247] However, the uncertainty remains in general waste legislation, and is therefore relevant where product-specific legislation fails to address the waste stage or does so in an incomplete fashion (such as in the case of the Batteries Directive).

In these other cases, the high threshold for products not to become waste effectively makes waste status the default in unclear situations. While this is a positive outcome in terms of health and environmental protection, it may harm the efficient use of resources in a circular fashion.

The Court's case-law could provide a way out of this situation. It is the Court's position that the terms waste and discard must be interpreted in light of the objectives of the WFD.[248] However, the objectives of said Directive have changed as the Union's legislature has sought to boost the uptake of circular economy. For instance, the original Article 1 of the WFD – "Subject matter and scope" – only made reference to waste prevention and efficiency in resource use as means "to protect the environment and human health".[249] While preserving this overall hierarchy, Directive (EU) 2018/851 added an explicit reference to such strategies

[247] In relation to re-used batteries, the uncertainty arises from the fact that the line between reuse itself (which is not a waste management operation) and preparation for re-use (which concerns waste) is not clearly defined. Additionally, it is also somewhat circular: waste is a substance that the holder intends to discard, but, in assessing this intention, the need for preparation for re-use is a relevant criterion (therefore, operations concerning waste being re-used are preparation for re-use, but waste means materials needing such preparation).

[248] See, for instance, Case C-188/07 *Commune de Mesquer v Total France SA and Total International Ltd.* [2008] ECLI:EU:C:2008:359, par. 38.

[249] Waste Framework Directive, Article 1 (original).

being "crucial for the transition to a circular economy and for guaranteeing the Union's long-term competitiveness."[250]

On the basis of this, it might be possible for the interpretation of relevant legislation to open space for circular economy considerations (for instance, where a substance is not certain to be reused, but is still highly likely to be so, and where adequate waste management is foreseen for unused substances or products).

However, in light of the above, the continued prevalence of environmental considerations, combined with the broad definition of the key terms "waste" and "discard", will uphold an expansive understanding of what constitutes waste.

As outlined in previous sections, uncertainty currently also extends to the conditions under which used batteries can be put to use for their second life-cycle, the legal standing of repurposing in relation to the overall waste management approach (which is focused on recycling), and over who is responsible for the battery's waste management.

For specific businesses seeking to implement repurposing for energy storage, uncertainties might mean that repurposing can be carried out as long as they are erring on the side of caution in compliance terms. This includes ensuring conformity with general legislation on products and – where existing – energy storage installations. Where technically possible, there is no specific reason why repairing and reusing waste batteries should not be possible. However, this raises the question of profitability in the face of high precautionary compliance costs and the commercial risk of legal uncertainty.

Finally, while not a concern for businesses limiting their activities to one single Member State, adding an international dimension could engender further complications and compliance obligations. In the EU, shipments of waste between Member States are governed by Regulation (EC) 1013/2006, on shipments of waste, which is also undergoing a revision under the Circular Economy Action Plan in

[250] Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste [2018] OJ L150/109, Article 1(1).

order to facilitate shipment of waste for reuse and recycling.[251] As both key pieces of legislation in this situation (on batteries and on waste shipments) are undergoing revisions, the effects on the uncertainties identified remain unclear. However, the proximity of Sweden to key markets for EVBs (Norway being the market with widest uptake, and Germany the largest market in absolute terms) might make this external dimension relevant. [252]

The point at the heart of this thesis has been that, under current EU law, a trade-off can appear between environmental protection as we have traditionally understood it and the recycling and reutilization of resources (which are a key requisite of more sustainable societies). To successfully strike a balance and guarantee that both objectives are reached, policy-makers need to empoweer economic operators to participate in the transition towards more circular and sustainable economic systems. In the case at hand, this could entail both binding and non-binding measures to further enhance clarity in the legal framework for second-hand EVB repurposing.

[251] European Commission, 'Proposal for a Regulation of the European Parliament and of the Council on shipments of waste and amending Regulations (EU) 1257/2013 and (EU) 2020/1056' (Communication) COM (2021) 709 final.

[252] As hinted at at the end of section 4.5, the transboundary movement of batteries is also relevant in determining responsibility for them.

Reference list / Bibliography

Official Publications

European Commission, ’Guidelines on the interpretation of key provisions of Directive 2008/98/EC on waste’ (2012) < https://ec.europa.eu/environment/pdf/waste/framework/guidance_doc.pdf > Accessed 26 May 2022

European Commission, ‘The European Green Deal’ (Communication) COM (2019) 640 final

European Commission, ’ Proposal for a regulation of the European Parliament and of the Council concerning batteries and waste batteries repealing Directive 2006/66/EC and amending Regulation (EU) 2019/1020’ (Communication) COM (2020) 798 final

European Commission, ‘A new Circular Economy Action Plan: For a cleaner and more competitive Europe’ (Communication) COM (2020) 98 final

European Commission, ‘Sustainable and Smart Mobility Strategy – putting European transport on track for the future’ (Communication) COM (2020) 789 final

European Commission, ‘Proposal for a Regulation of the European Parliament and of the Council on shipments of waste and amending Regulations (EU) 1257/2013 and (EU) 2020/1056’ (Communication) COM (2021) 709 final

European Parliament, ’A comprehensive European approach to energy storage`, resolution of 10 July 2020 P9_TA(2020)0198

European Parliament, ’Batteries and waste batteries. Amendments adopted by the European Parliament on 10 March 2022 on the proposal for a regulation of the European Parliament and of the Council concerning batteries and waste batteries, repealing Directive 2006/66/EC and amending Regulation (EU)’ P9_TA(2022)0077

IPCC, 'Summary for Policymakers' in Shukla P.R, Skea J, Slade R, Al Khourdajie A, van Diemen R, McCollum D, Pathak M, Some S, Vyas P, Fradera R, Belkacemi M, Hasija A, Lisboa G, Luz D, Malley J, (eds.), *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2022)

Literature

Albertsen L, Luth Richter J, Peck P, Dalhammar C and Plepys A, ' Circular business models for electric vehicle lithium-ion batteries: An analysis of current practices of vehicle manufacturers and policies in the EU' [2021] < https://www.sciencedirect.com/science/article/pii/S0921344921002676 > Accessed 26 May 2022

Argyrou A, 'Making the Case for Case Studies in Empirical Legal Research' [2017] Utrecht Law Review 95

Backes C, 'The Waste Framework Directive and the Circular Economy' in Peeters M and Eliantionio M (eds), *Research Handbook on EU Environmental Law* (Edward Elgar Publishing 2020),

Bourguignon D, *EU policy and legislation on chemicals. Overview, with a focus on REACH* (European Parliament Research Service 2019)

Dahllöf L, Romare M and Wu A, 'Mapping of lithium-ion batteriees for vehicles: A study of their fate in the Noridc countries' (Nordic Council of Ministers 2019) < https://www.norden.org/en/publication/mapping-lithium-ion-batteries-vehicles > Accessed 26 May 2022

Elkind E, 'Reuse and Repower: How to Save Money and Clean the Grid with Second-Life Electric Vehicle Batteries' (2014) < https://escholarship.org/uc/item/32s208mv > (Bank of America, Berkeley Center for Law, Energy & the Environment, and UCLA Emmett Institute on Climate Change and the Environment 2014) Accessed 26 May 2022

European Commission, 'Future Brief: Towards the battery of the future' (2018) <https://ec.europa.eu/environment/integration/research/newsalert/pdf/towards_the_battery_of_the_future_FB20_en.pdf> Accessed 26 May 2022

Führ M and Schenten J, 'Industrial Chemicals in the Regulatory Laboratory: Self-responsibility and Inclusive Governance' in M Peeters and M Eliantionio (eds), *Research Handbook on EU Environmental Law* (Edward Elgar Publishing 2020)

Groupe Renault, 'Innovation Deal: From E-mobility to Recycling – The Virtuous Loop of Electric Vehicle. Assessment of legal and regulatory barriers to the optimization of EV Battery Life Cycle' (2018) < https://www.renaultgroup.com/wp-content/uploads/2020/05/deliverable-1_evbatteries_innovation_deal_20181004.pdf > Accessed 26 May 2022

Halleux V, 'New EU regulatory framework for batteries: Setting sustainability requirements' (European Parliament Research Service, 2022) < https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2021)689337 > Accessed 26 May 2022

Kestemont L, *Handbook on Legal Methodology: From Objective to Method* (Intersentia 2018)

Kirchherr J, Reike D and Hekkert M, 'Conceptualizing the circular economy: An analysis of 114 definitions' [2017] Resources, Conservation & Recycling 221

Nordic Energy Research, 'Nordic Clean Energy Scenarios: Solutions for Carbon Neurality' (2021) < https://www.nordicenergy.org/publications/nordic-clean-energy-scenarios-solutions-for-carbon-neutrality/ > Accessed 26 May 2022

Peczenik A, 'Empirical Foundations of Legal Dogmatics' [1969] Logique et Analyse 32, p. 34

Rubin E.L, 'Law and and the methodology of the law' [1997] Wisconsin Law Review 521, p. 541

Shahjalal M, Kubar Roy P, Shams T, Fly A, Islam Chowdhury J, Ahmed R and Liu K, 'A review on second-life of Li-ion batteries: prospects, challenges, and issues' [2022] Energy <

https://www.sciencedirect.com/science/article/pii/S0360544221031303 > Accessed 26 May 2022

Tejada-Arango D, Siddiqui A, Wogrin S and Centeno E, 'A Review of Energy Storage System Legislation in the US and the European Union' [2019] Current Sustainable/Renewable Energy Reports 22

Turunen T, 'Deconstructing the Bottlenecks Cause by Waste Legislation: End-of-Waste Regulation' [2017] Journal for European Environmental & Planning Law 186

Online sources

BilRetur, 'BilRetur – Bilproducenternas nätverk' (n.d.) <https://bilretur.se/bilretur-bilproducenternas-natverk/ > Accessed 26 May 2022

Council of the EU, 'Sustainable batteries: member states ready to start negotiations with Parliament' (17 March 2022) <https://www.consilium.europa.eu/en/press/press-releases/2022/03/17/sustainable-batteries-member-states-ready-to-start-negotiations-with-parliament/> Accessed 26 May 2022

Elfström C, 'En ny laddstation var tjugonde minut – bilbranschens krav på Sverige för att klara klimatmålen' (*SVT*, 2 May 2022) < https://www.svt.se/nyheter/inrikes/en-ny-laddstation-var-tjugonde-minut-eu-s-krav-pa-sverige-for-att-klara-klimatmalen > Accessed 26 May 2022

Erickson C, 'Raw materials in short supply for EV makers struggling to meet customer demand' (*S&P Global Market Intelligence*, 29 March 2022) < https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/raw-materials-in-short-supply-for-ev-makers-struggling-to-meet-customer-demand-69458070 > Accessed 26 May 2022

European Commission 'Speech by President-elect von der Leyen in the European Parliament Plenary on the occasion of the presentation of her College of Commissioners and their programme' (27 November 2019) <

https://ec.europa.eu/commission/presscorner/detail/en/speech_19_6408 > Accessed 26 May 2022

European Environment Agency 'Greenhouse gas emissions from transport in Europe' (18 November 2021) < https://www.eea.europa.eu/ims/greenhouse-gas-emissions-from-transport > Accessed 26 May 2022

European Environment Agency 'New registrations of electric vehicles in Europe' (18 Noember 2021) < https://www.eea.europa.eu/ims/new-registrations-of-electric-vehicles > Accessed 26 May 2022

Eurostat, 'How are emissions of greenhouse gases in the EU evolving?' (n.d.) < https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-4a.html?lang=en > Accessed 26 May 202

Hagman J, 'Second-life för elbilsbatterier – Applikationer, möjligheter och utmaningar' (*omEV*, 28 January 2022) < https://omev.se/2022/01/28/second-life-for-elbilsbatterier-applikationer-mojligheter-och-utmaningar/ > Accessed 26 May 2022

Naturvårdsverket, 'När avfall upphör att vara avfall' (n.d.) < https://www.naturvardsverket.se/vagledning-och-stod/avfall/nar-avfall-upphor-att-vara-avfall/ > Accessed 26 May 2022

Regeringskansliet, ' Genomförande av elmarknadsdirektivet när det gäller nätverksamhet' (28 December 2021) < https://www.regeringen.se/rattsliga-dokument/lagradsremiss/2021/12/genomforande-av-elmarknadsdirektivet-nar-det-galler-natverksamhet/ > Accessed 26 May 2022

UNFCCC, Landmark Climate Change Agreement to Enter into Force' (5 October 2019) < https://unfccc.int/news/landmark-climate-change-agreement-to-enter-into-force > Accessed 26 May 2022

Cases

European Union

Court of Justice of the European Union

ARCO Chemie Nederland Ltd v Minister van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer (C-418/97) and Vereniging Dorpsbelang Hees, Stichting Werkgroep Weurt+ and Vereniging Stedelijk Leefmilieu Nijmegen v Directeur van de dienst Milieu en Water van de provincie Gelderland (C-419/97), Joined Cases C-418/97 and C-419/97 [2000] ECLI:EU:C:2000:318

Commune de Mesquer v Total France SA and Total International Ltd., Case C-188/07 [2008] ECLI:EU:C:2008:359, par. 38

Lapin elinkeino-, liikenne- ja ympäristökeskuksen liikenne ja infrastruktuuri - vastuualue v Lapin luonnonsuojelupiiri ry, Case C-358/11 [2013] ECLI:EU:C:2013:142

Openbaar Ministerie v Tronex BV, Case C-624/17 [2019] ECLI:EU:C:2019:564

Shell Nederland Verkoopmaatschappij BV and Belgian Shell NV, Joined Cases C-241/12 and C-242/12 [2013] ECLI:EU:C:2013:821