

# BATTERIES AND SMALL WEEE IN RESIDUAL WASTE

by Erion WEEE and Erion Energy

## Recovery of batteries and small WEEE

from residual waste treatment facilities and  
from the separate collection of packaging waste





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and small WEEE from  
residual waste  
treatment facilities  
and from the separate  
collection of  
packaging waste**

# MSW MANAGEMENT

The management of municipal waste is the responsibility of the municipalities (308), which are organized into 23 regional companies (SGRU).

Each SGRU manages various types of treatment units (for both unsorted waste and selective collection): sorting; composting/anaerobic digestion; RDF production; landfills; incinerators.

Every year, they must carry out characterizations of the waste they manage.

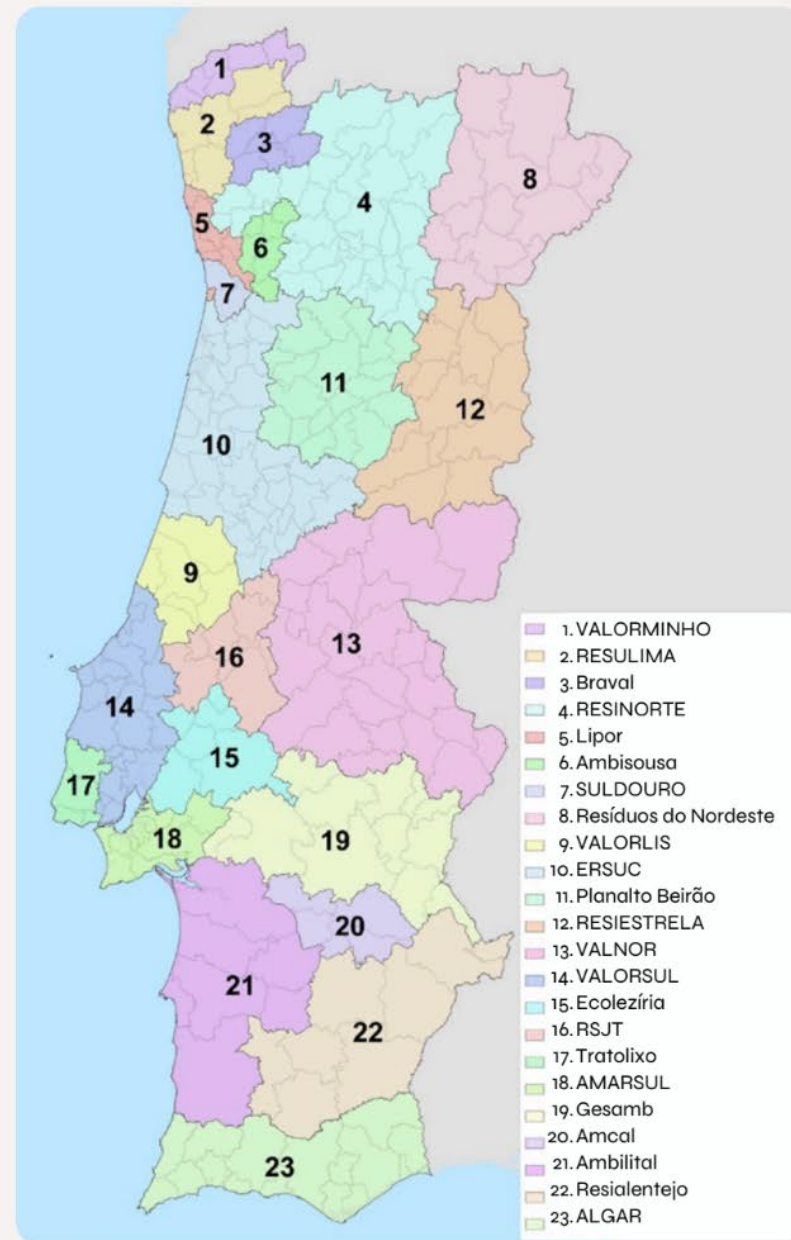
In 2024, SGRU managed a total of:

**4,081,716 tons**

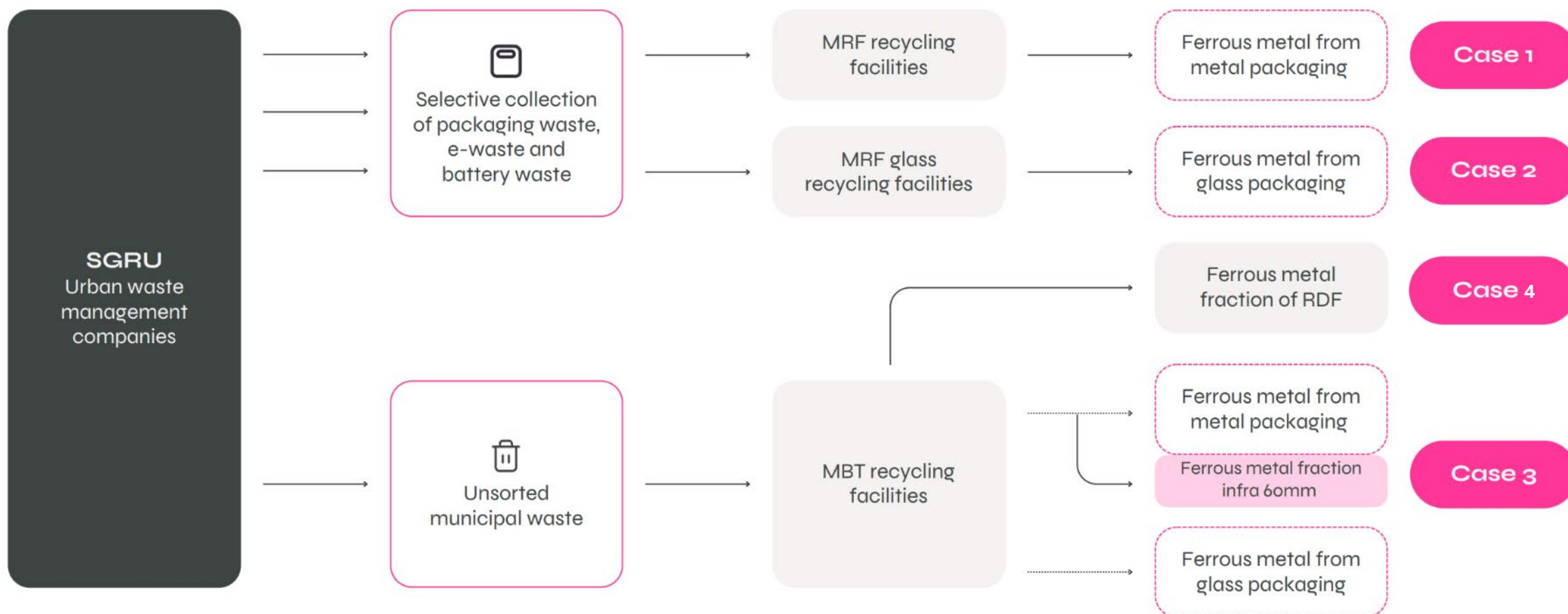
**of unsorted municipal waste, which included 978 tons of batteries (0.024%);**

**1,148,130 tons**

**of packaging waste** (paper, plastics, glass, metals, wood).

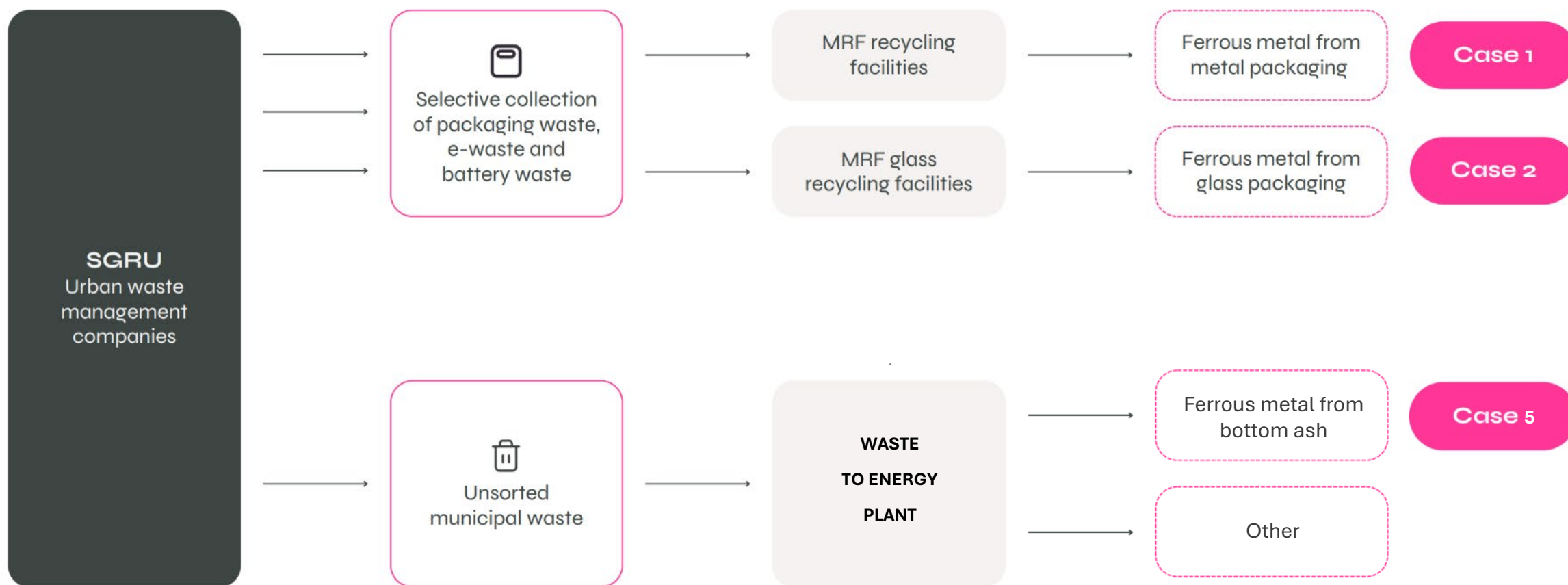


Certain fractions resulting from the treatment of unsorted municipal waste and selectively collected packaging waste have been identified as having potential for battery recovery.



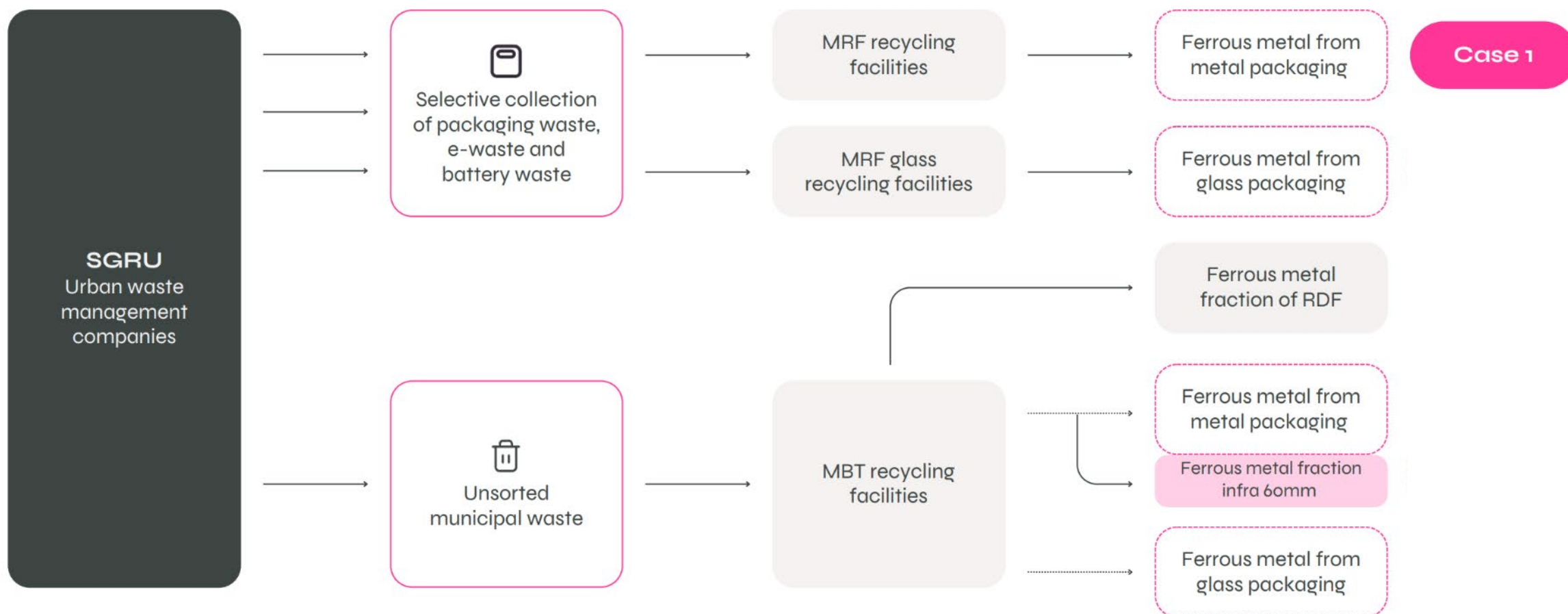
Electrão has mapped several cases where batteries and small WEEE are known to co-mingle with other waste streams. Each with different origins, volumes, and recovery complexity.

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# FERROUS METAL FROM PACKAGING

(from separate collection – yellow container)



Common fraction present in all MRF (sorting) facilities



Currently shipped to metal shredder facilities



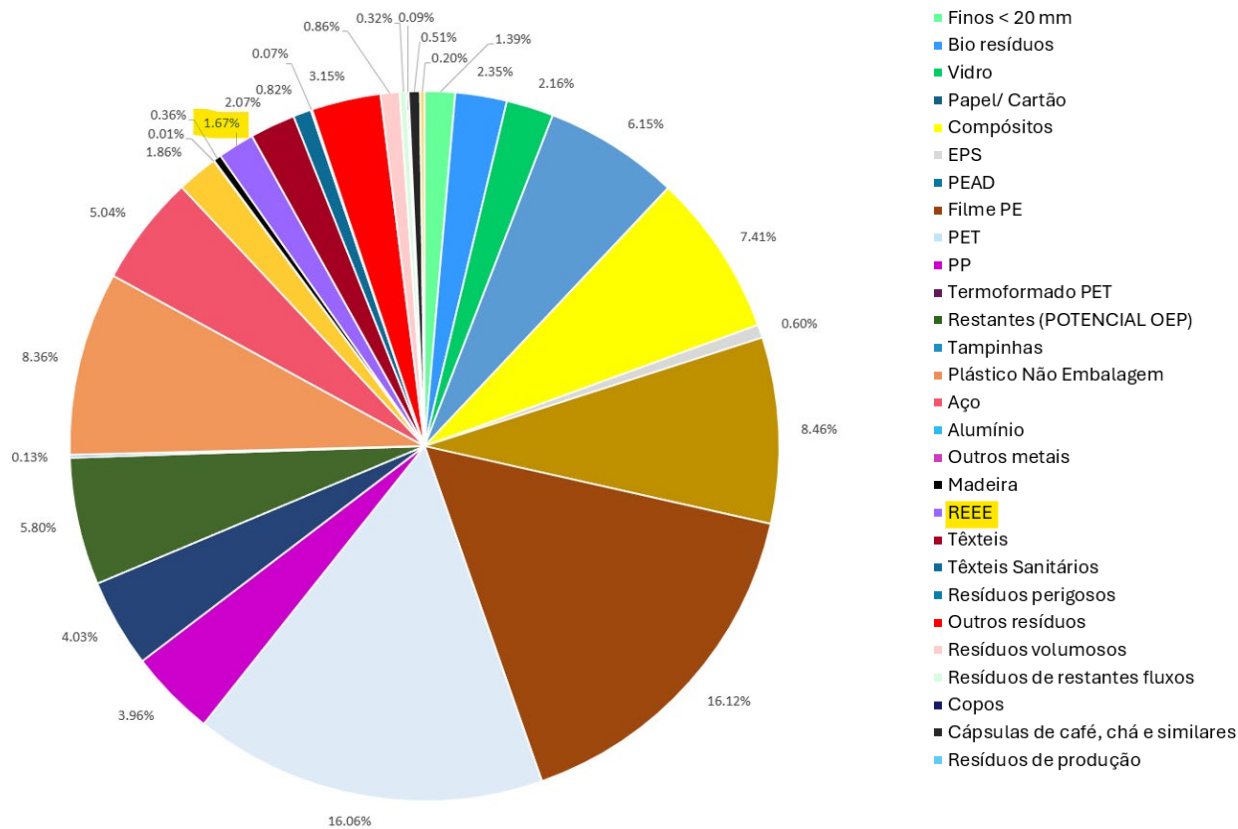
Content in batteries

Case 1

# YELLOW BIN STUDY

To improve packaging recycling performance and meet the targets established by the Packaging Directive and the Packaging and Packaging Waste Regulation (PPWR), the Portuguese Environment Agency has requested that Electrão, Novo Verde, and SPV carry out a characterization study of the waste collected through the yellow recycling bin, as well as the sorting rejects generated at Urban Waste Management Systems to be conducted in 2026.

Average composition of the yellow bin



(Preliminary data regarding the initial characterizations performed)

Total quantity characterized : **21 178,63 kg**

Urban Waste Management Systems: **14**

WEEE: **1,67 %**

Bateries: **0,02 %**

| WEEE | Typology           | Quantities (kg) | %      |
|------|--------------------|-----------------|--------|
|      | Small equipment    | 316,74          | 1,496% |
|      | Computer equipment | 17,27           | 0,082% |
|      | WEEE components    | 14,98           | 0,071% |
|      | Tube lamps         | 3,29            | 0,016% |
|      | Compact lamps      | 0,62            | 0,003% |
|      | Other              | 0,98            | 0,005% |
|      | Total              | 21 178,63       | 1,67%  |

| Typology | Quantities (kg) | %     |
|----------|-----------------|-------|
| Bateries | 3,98            | 0,02% |

As the characterization campaign is still ongoing, it should be emphasized that these results are highly preliminary.

# CHARACTERIZATION STUDY ON BALLISTIC SEPARATOR FINES

Rejected fraction <40 mm

Case 1

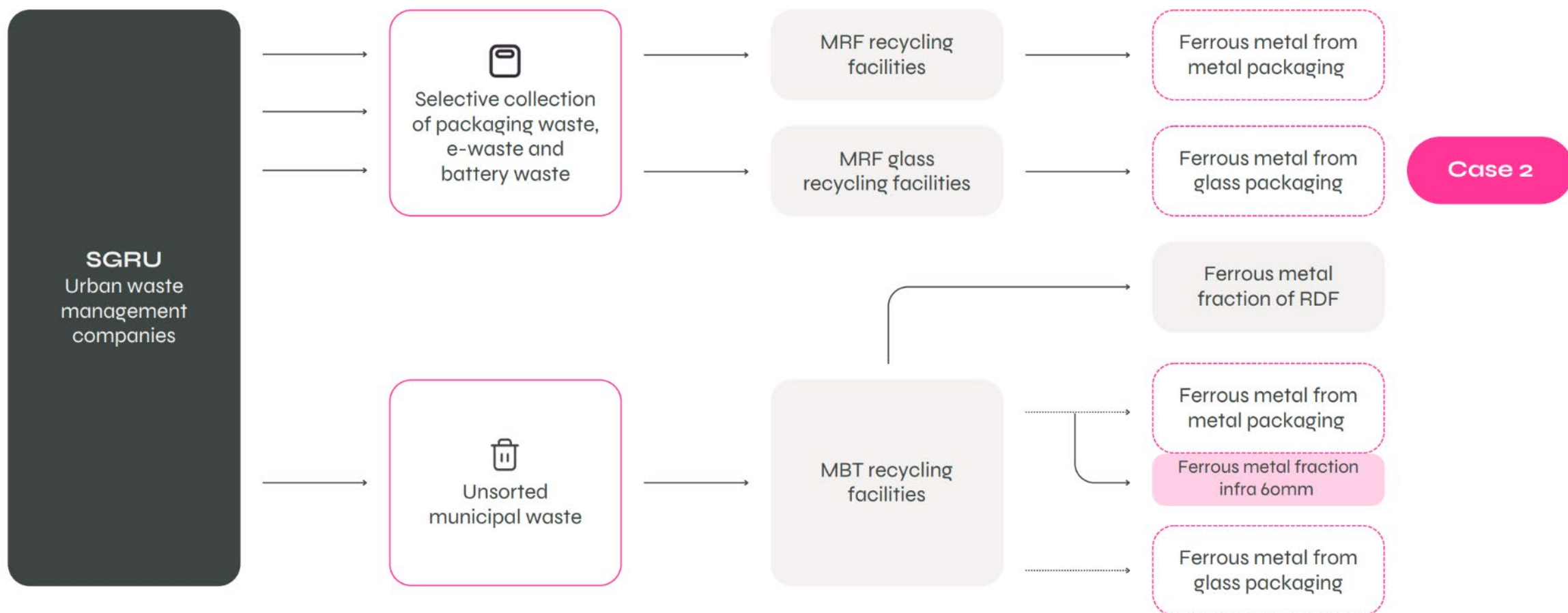
→ Although not visually apparent, a considerable content of batteries is present in this <40 mm reject fraction, from Ballistic Separator (existing in every MRF and MBT Plants:

| 2022 Data         | MRF Plant<br>Valorsul<br>Lumiar | MRF Plant<br>Valorsul<br>Oest |
|-------------------|---------------------------------|-------------------------------|
| <b>Batteries</b>  | <b>14</b>                       | <b>6</b>                      |
| Plastic packaging | 515                             | 156                           |
| Glass             | 509                             | 81                            |
| Ferrous Metal     | 79                              | 33                            |
| Non-Ferrous Metal | 81                              | 32                            |

Electrão has requested a new characterization study from Valorsul and plans to carry out a recovery pilot test at the RSA



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## FERROUS METAL FROM SEPARATE COLLECTION OF GLASS



The municipal battery container is often associated with the glass container



During collection operations, there is the potential for these two materials to be mixed

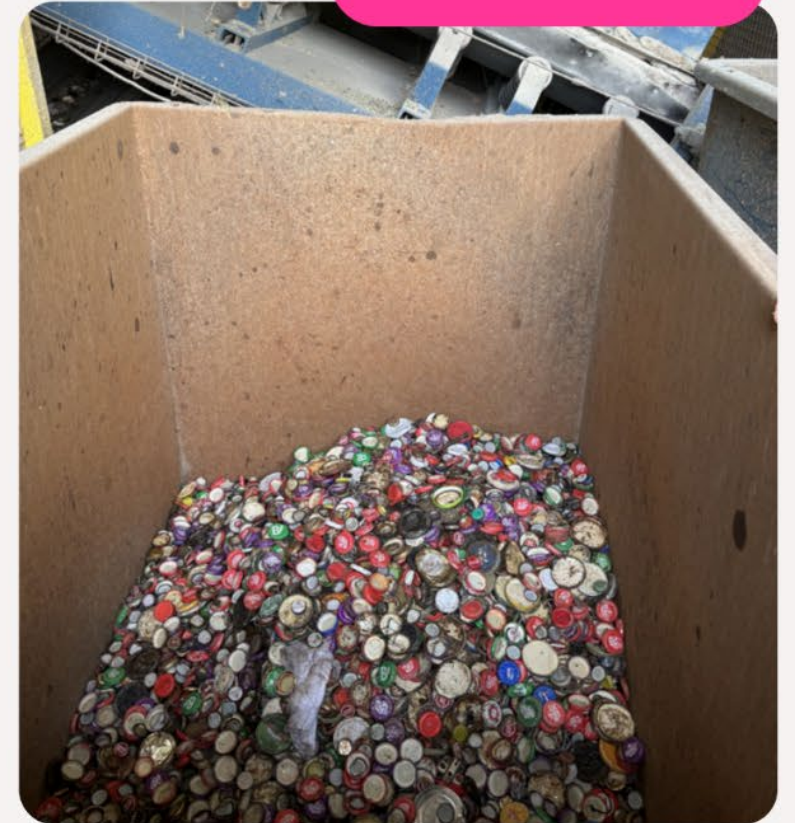
# FERROUS METAL FROM SEPARATE COLLECTION OF GLASS



Common fraction present in all glass recycling facilities



Output from glass recycling packaging - labels

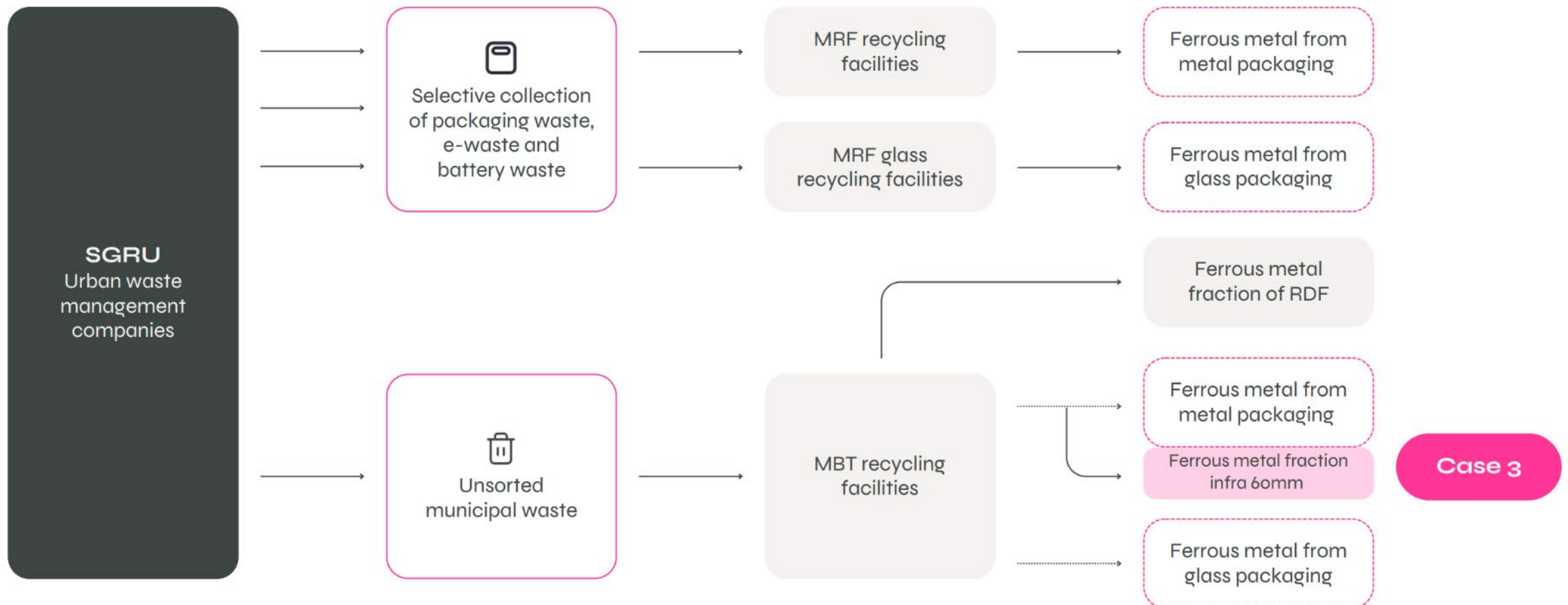


Visible presence of batteries  
(still in characterization)

Case 2

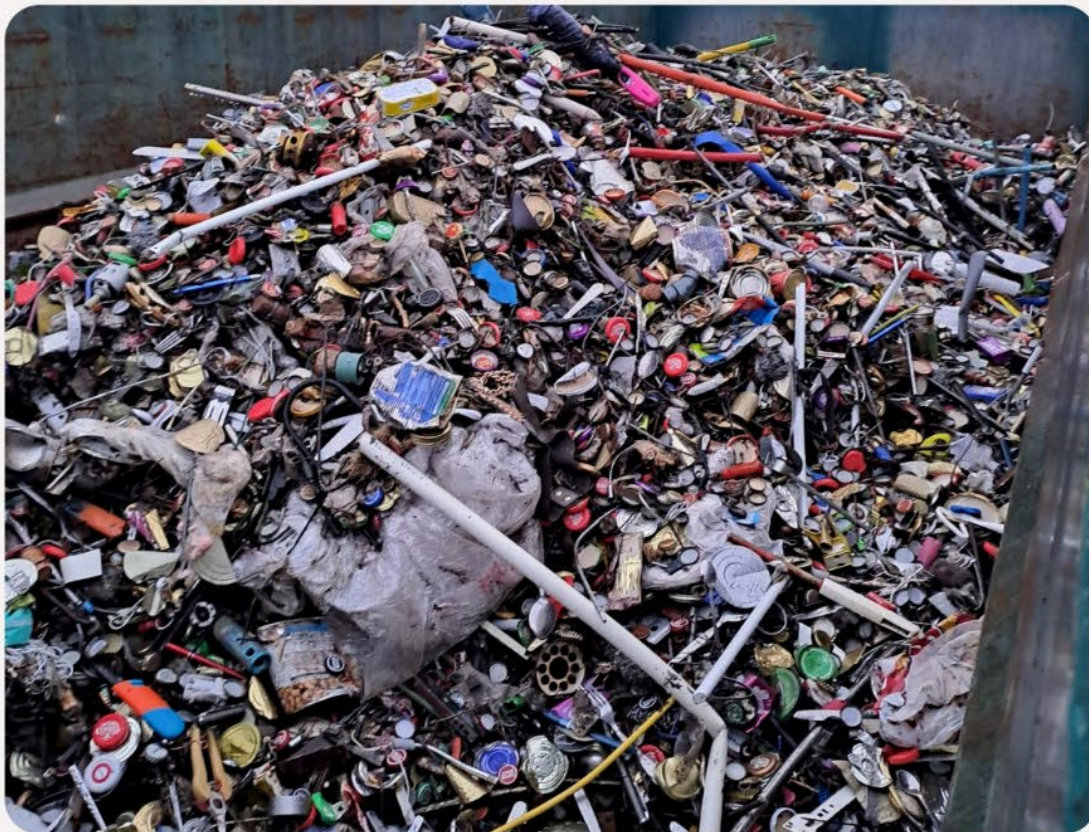
→ Batteries are present in the ferrous output of glass recycling facilities — characterisation work is ongoing to quantify the scale.

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## FERROUS METAL FRACTION INFRA 60MM

(from unsorted waste treatment)



Common fraction present in all MBT (mechanical-biological treatment) plants, Currently shipped together with other ferrous materials in mixed steel packaging loads



Case 3

Visible presence of batteries

# FERROUS METAL FRACTION INFRA 60MM

(from unsorted waste treatment)

Date of characterization

13/03/2024

Characterization site

Planalto Beirão

Sample quantity (kg)

240,82

| Categories                                | Sample (kg)   | Percentage (%) |
|-------------------------------------------|---------------|----------------|
| Fine <20mm                                | 49,71         | 20,64%         |
| Biowaste                                  | 0,33          | 0,14%          |
| Paper/Cardboard and ECAL                  | 1             | 0,42%          |
| Plastics                                  | 1,99          | 0,83%          |
| Metals                                    | 157,36        | 65,34%         |
| . Ferrous packaging waste                 | 81,53         | 33,86%         |
| . Non-ferrous packaging waste             | 0,03          | 0,01%          |
| . Other ferrous waste                     | 75,62         | 31,40%         |
| . Other non-ferrous waste                 | 0,18          | 0,07%          |
| Glass                                     | 0,35          | 0,15%          |
| . Glass packaging waste                   | 0,35          | 0,15%          |
| . Other glass waste                       | 0             | 0,00%          |
| Wood                                      | 0,88          | 0,37%          |
| Waste electrical and electronic equipment | 4,94          | 2,05%          |
| Batteries                                 | 2,34          | 0,97%          |
| Other waste                               | 21,92         | 9,10%          |
| <b>Total</b>                              | <b>240,82</b> | <b>100,00%</b> |

Case 3



Steel from packaging  
34%

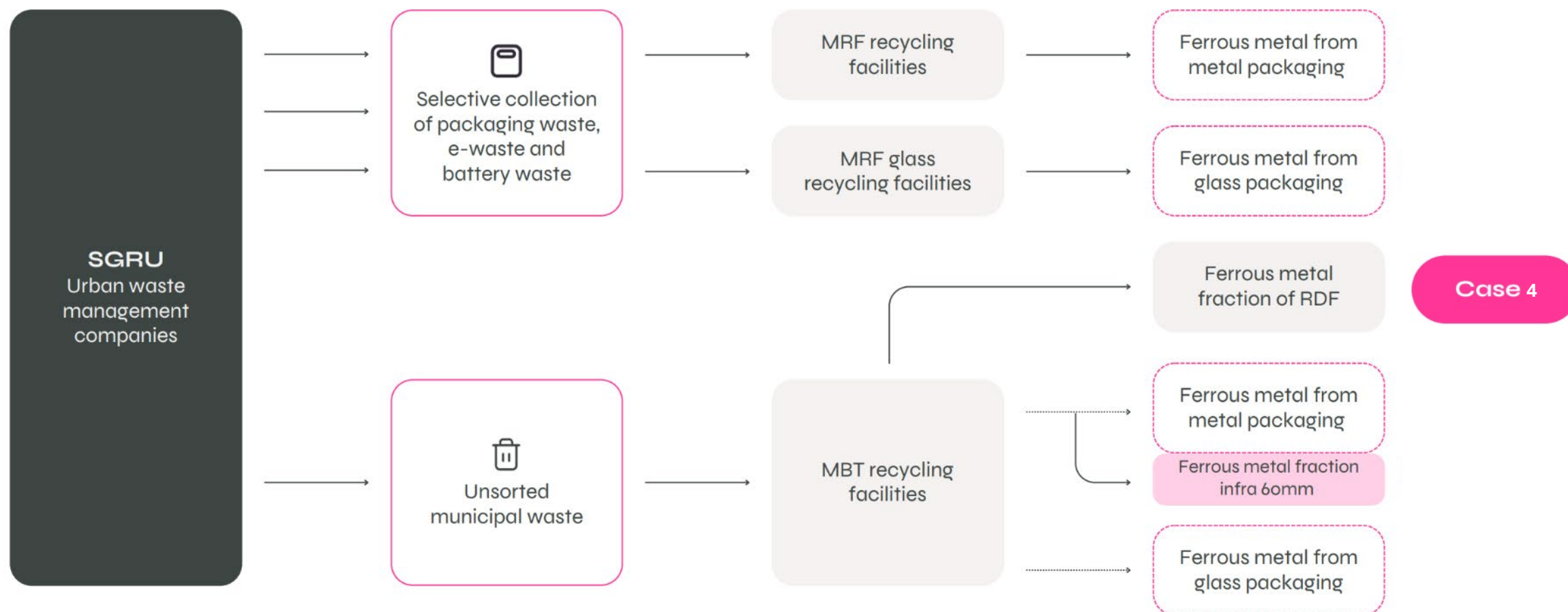


Small e-waste  
2%



Batteries  
1%

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# Ferrous Metal Fraction from RDF

Planalto Beirão

12/03/2024

Planalto Beirão

171,08 kg

| Categorias                                              | Amostra (kg)  | Percentagem (%) |
|---------------------------------------------------------|---------------|-----------------|
| <b>Finos &lt;20mm</b>                                   | <b>14,53</b>  | <b>8,49%</b>    |
| <b>Bio Resíduos</b>                                     | <b>0,00</b>   | <b>0,00%</b>    |
| <b>Papel/Cartão e ECAL</b>                              | <b>1,73</b>   | <b>1,01%</b>    |
| <b>Plásticos</b>                                        | <b>10,64</b>  | <b>6,22%</b>    |
| <b>Metais</b>                                           | <b>85,57</b>  | <b>50,02%</b>   |
| Resíduos de embalagens ferrosas                         | 48,45         | 28,32%          |
| Resíduos de embalagens não ferrosas                     | 2,50          | 1,46%           |
| Outros resíduos ferrosos                                | 34,61         | 20,23%          |
| Outros resíduos não ferrosos                            | 0,01          | 0,01%           |
| <b>Vidro</b>                                            | <b>0,07</b>   | <b>0,04%</b>    |
| Resíduos de embalagens de vidro                         | 0,07          | 0,04%           |
| Outros resíduos de vidro                                | 0,00          | 0,00%           |
| <b>Madeira</b>                                          | <b>0,38</b>   | <b>0,22%</b>    |
| <b>Resíduos de Equipamentos elétricos e eletrônicos</b> | <b>19,21</b>  | <b>11,23%</b>   |
| <b>Pilhas e acumuladores</b>                            | <b>6,34</b>   | <b>3,71%</b>    |
| <b>Outros resíduos</b>                                  | <b>32,61</b>  | <b>19,06%</b>   |
| <b>Total</b>                                            | <b>171,08</b> | <b>100,00%</b>  |

40% Ferrous packaging

11% Small WEEE

~4% Batteries



Case 4



Pilhas 3,7%

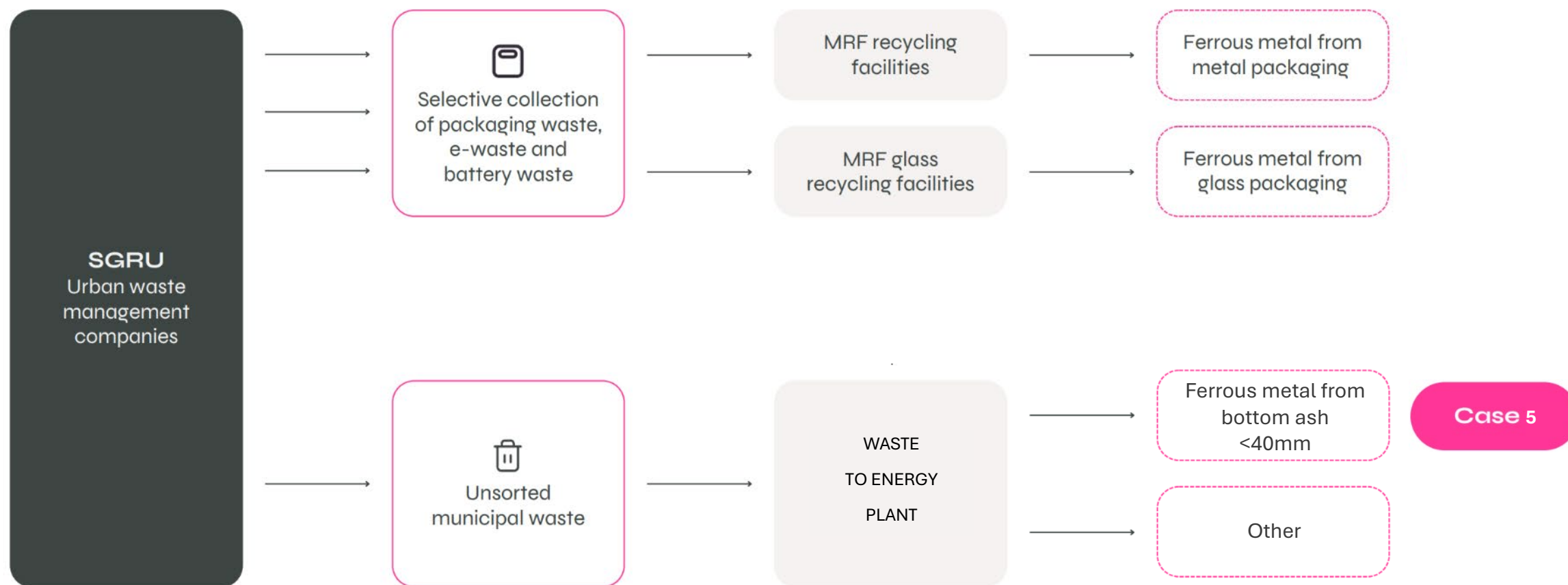


Aço embalagem 28%



Pequenos REEE 11%

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# Ferrous Metal Fraction from Bottom ash

Valorsul

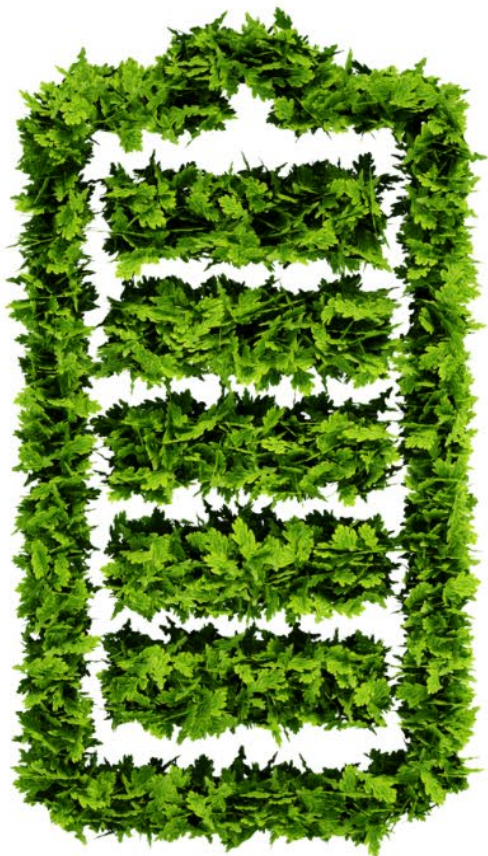
- Valorsul currently sends this fraction mixed with the >40 mm ferrous fraction as packaging material.
- Valorsul will further assess and quantify its annual production (segregated from >40mm)
- Electrão has requested a characterization study and plans to carry out a recovery pilot test at the RSA
- Electrão will prepare a proposal for the direct take-back of this fraction, applying the packaging compensation value to the entire stream, including the non-packaging fraction.

Case 5

Ferrous fraction of bottom ash containing batteries



# CONCLUSIONS



Regardless of the progress we may make in the selective collection of batteries, there will always be quantities of these wastes present in other parallel flows (unsorted waste, packaging and WEEE).



It is important to map, quantify, and characterize these parallel flows in order to define their potential for increasing the battery collection rate.



Preliminary results from the work carried out by Electrão indicate the existence of potential in various metallic fractions produced in the treatment of unsorted waste and packaging waste. Activities are now being initiated to determine the technical and economic capacity for their separation.

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