

CONSTRAINS AND OPPORTUNITIES IN THE END OF LIFE MANAGEMENT OF ELECTRICAL AND ELECTRONIC EQUIPEMENT IN ITALY

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ABSTRACT

The present paper concerns critical situations and opportunities of the WEEE (Waste Electrical and Electronic Equipment) life cycle in Italy.

Presenting the major players dealing with WEEE end of life treatments and following their processes from the collection to recovered materials, major weaknesses of regulations and plant engineering are outlined and analyzed.

Loss during collection, theft (so called “*cannibalization*”), unjustified complexity of recovery targets evaluation, poor choices of waste management systems, illegal exports, give to the Italian WEEE system large areas of improvement.

The recoverable materials (rare earth elements, precious metals) make the WEEE supply chain very interesting both economically and strategically. In this paper, we propose economic forecasts and engineering solutions to improve the Italian WEEE system.

INTRODUCTION

The European directive 2002/96/CE on WEEE (EU, 2003) was implemented in Italy in 2005 with legislative decree 151, in which the “constrained subjects” and the concept of ‘producer’s responsibility’ were defined and the Collection System was chosen as the organizer of the system financed by the producers.

The Collection System deals with collection, transportation and treatment of the waste in an attempt to maximize the material’s recovery. In addition to this, the decree ratified specific recovery targets, valid until the coming into effect of the new European directive 2012/19/EU (EU, 2012), which will have to be implemented in Italy by 2014.

The supply chain of the WEEE in Italy is organized by the Collection Systems (SC) under the supervision of the WEEE Coordination Centre (CdC) and the Vigilance Committee (Ancitel and CdC RAEE, 2011). The legislation would also consider other authorities, but these have never been activated because of a lack of implementation decrees.

The collection takes place in the waste separation and recycling areas (so called “*Isole Ecologiche*”) or in the retail stores when a new device is purchased (*‘one to one’*). The collection and transportation to the plants are made by SC and coordinated by the CdC, which should guarantee uniform operating conditions in the whole country. The collection is sorted

in accordance with the different kinds of WEEE, which are divided into 5 groups (R1: refrigerating devices, R2: large household appliances, R3: TVs and monitors, R4: PED, CE, ITC, etc., and R5: light sources). For every group, different targets of recovery have to be reached. The calculation of these targets is simple only for the first 2 group, while in the other cases it is based on the samplings of the input at the plants, which makes the results often not reliable (Scagliarino, 2012).

DISCUSSION

The first critical situation of the system is due to a lack of implementation decrees. This circumstance does not allow the supply chain to develop completely, after 8 years of the issuing of the Law 151/05. According to the new European legislation (EU, 2012), the collection's targets should be proportional to the devices introduced in the market, depending on the type of the products. Generally, at least the 70% of the WEEE should be collected, a value which is way below the percentage of the today's collection rate, which does not exceed the 30% on average (Fondazione per lo sviluppo sostenibile – Fise Unire, 2013).

The loss of the end-of-life products is caused on the one hand by a bad disposal of the users, on the other by the illegal collection made by some operators, who are external to the supply chain and illegally dispose of the waste collected. These devices are sent abroad, to developing countries (Asia and Africa) as 'out-of-order' devices (therefore subject to different laws) or with illegal shipment (Scagliarino, 2012).

The WEEE collected through the official supply chain may sometimes not be intact. Quite often they are '*cannibalized*', which means that the parts with an economic value are stolen, making the products less interesting. The percentages change according to the different Italian regions, but they can sometimes reach 50% of the devices, which means that one device out of two is deprived of some parts (Ancitel and CdC RAEE, 2011). It should be remembered that very valuable materials such as platinum, gold, silver, etc. and very rare components like rare earth elements etc. may be found in this kind of waste. The economic potential of this kind of waste has been appraised by calculating the total amount of the material obtainable, according to the data of the WEEE collected. It has been calculated that 20% of the devices are cannibalized in the collecting area, therefore the economic damage can be quantified.

Depending on the prices of materials recovered and on the potential of reuse of WEEE collected, it has been estimated that €150 million can be earned from 260000 tons collected. Subtracting the operating cost, there is a theoretical margin of €0,40 per kg. Eliminating the loss due to the leakage of the devices from the official supply chain and the loss of the parts of economic interest caused by the cannibalization in the waste separation and recycling areas ("*Isole Ecologiche*"), would result in a considerable increase of the economic potential of this waste (Scagliarino, 2012; WRAP, 2011).

Another aspect, which would improve the performances of the supply chain, could be an incentive to the efficiency of the procedure and the plants. In Italy, there are a lot of first level plants, which deal with a pre-processing process including the disassembly, separation and recovery of the different parts. They are well-distributed on the whole territory, although they are usually inadequate because of the uncertain and economically not interesting supply system. With regards to the second level plants, which deal with the extraction of the material, particularly metals, precious metals and rare earth elements, they are usually inadequate and

not well- distributed on the territory; for example, there are 18 plants for the recovery of precious metals: 8 of them are in the same region (in Central Italy), 7 in the North and only 3 in the South and Islands. This lack of second level plants has encouraged sending the pre-processed materials to foreign plants, which are technologically more advanced and administratively better organized. None of the Italian plant carries out the complete treatment “*from the device to the ingot*”.

There are some developing treatments for the extraction of metal that could make the final treatment of the WEEE very advantageous: heat treatment (pyro-metallurgy) and wet treatment (hydrometallurgy). This highlights that, with regards to the plants, some good results are achieved, but they are not developed in practical terms, except by a few factories.

CONCLUSIONS

The present work shows the aspects that have to be analysed to increase the WEEE supply system. We have demonstrated that it's an interesting system at an economic level, both for recoverable materials and for the possible development, as the market of the electrical and electronic equipment is always increasing. The first objective to be achieved is attempting to collect all the waste in the official supply chain and limit the cannibalization. The issue about the WEEE's property is still unsolved.

As the materials inside of the WEEE are very precious and economically interesting, we can't ignore the importance of valuing the WEEE, both economically and strategically. This circumstance should persuade Italy to upgrade the plant system which is not well developed, both for the geographical distribution and the technology, and to invest in the supply chain.

We should also consider the potentiality of reusing the devices, in particular the small ones, which are often discarded before their end of life, just because new models are launched or because they have small damages which could be easily and cheaply repaired. In particular, the new European directive 2012/19/EU explicitly requires achieving specific objectives regarding devices reusing.

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