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E-SCRAPNEWS

# CANADA TAKES CHARGE

**AS ELECTRONICS BECOME INCREASINGLY MOBILE, BATTERIES ARE BECOMING AN INCREASINGLY SIGNIFICANT PORTION OF THE E-SCRAP STREAM. SEVERAL CANADIAN PROVINCES HAVE IMPLEMENTED STEWARDSHIP PROGRAMS, BUT HOW FAR DO THEY GO, AND HOW EFFECTIVE ARE THEY AT MANAGING BATTERIES?**

BY CLARISSA MORAWSKI

By the end of this fall, more than two thirds of Canadians (those in British Columbia, Ontario, Manitoba and Quebec) will have mandatory collection and recycling programs for primary portable batteries in their province. Three of these provinces (British Columbia, Manitoba and Quebec) also mandate the recycling of rechargeable batteries. Stewards are required to provide sales and collection estimates as part of their annual reporting requirements. In the context of extended producer responsibility (EPR) programs for special wastes throughout North America, governments, industry and the public should be asking Canadians two critical questions: How well are these programs doing, and can they do better?

In these early days however, data and supporting methodologies on program performance make finding the answers quite difficult. As with many EPR programs today, presentation of data is carefully shaped by stewards to provide a best picture of the program, all the while in compliance with the broad definition outlined in the supporting law. Collectively, the reports are inconsistent with each other, derive sales using different methodologies, and may lack third-party oversight and detail.

In May, CM Consulting released *Managing Canada's Waste Batteries, 2012* – the first report of its kind which not only measured existing battery collection and recycling in Canada, but provided a wide range of information on the workings of battery programs, answering the "what, where, who, why and how" batteries are managed. The research involved independently assessing the transparency and certainty of data in order to present objective findings on the basis of compatible results. It serves to benchmark performance of battery collection and recycling programs and offers a useful resource for policy makers considering legislation for batteries.

In defining the methods required to review performance, Canada-specific parameters need to be addressed, relating to how the batteries are recycled and what they are recycled into. For example, should the weight of batteries used as energy-from-waste (EFW), or turned into slag in a thermal treatment facility for construction projects, be considered as recycling? These important complexities compel the need for different performance rates; each providing very specific information (see Table 1).

What becomes clear when considering battery collection and recycling is the process used to recycle the batteries and the various

end-uses of the outputs. The Recycling Efficiency Rate (RER) is the amount of material that is recycled into a raw material for future application by manufacturers compared the amount of material that was processed (a measure of input-output efficiency). Not all stakeholders define the RER the same way. Specifically, some choose to accept the weight of material burned for energy as recycling, others the weight of slag from thermal treatment for construction projects, and some include both.

## Table 1 | Definitions of performance rates

| | |
|---|---|
| Collection rate | The amount collected compared to the weight of batteries placed on the market in that jurisdiction, excluding exports. |
| Diversion rate | The amount of collected material that is not sent to landfill after processing (includes material used as slag and EFW) compared to the weight of batteries placed on the market in that jurisdiction, excluding exports. |
| Recovery rate | The amount of material that is recovered for recycling and energy recovery (EFW) compared to the weight of batteries placed on the market in that jurisdiction, excluding exports. |
| Recycling rate | The amount of material after processing that is recycled into a raw material for future application by product manufacturers compared to the weight of batteries placed on the market in that jurisdiction, excluding exports. |

*Managing Canada's Waste Batteries*, does not consider the weight of slag from thermal processing and the waste use as fuel as "recycling." This distinction was guided by the same methodology used by the European Commission for its own determination on the same issue. The EU incorporated the social, economic and ecological impacts to compare options, which when applied to the Canadian context supported excluding both in the recycling rate. Currently there is existing recycling capacity in Canada to exceed the mandated RER rates from Europe, as well as the targets in Canadian provinces.

Recycling efficiency should be based on high rates of recovery of the metals and elements to be used as substitutes for virgin materials that would otherwise have to be extracted, thereby achieving the maximum environmental benefit. The benefit from avoiding the production of virgin metals is the most significant factor in the LCA, which means that, if the process has a high recycling efficiency rate (RER), it is more likely to also have a more favourable environmental profile.

## Battery recycling in Canada

Canada is fortunate that it has recycling capacity for all battery types available in North America. These recycling industries are making investments to continue to improve and expand their capacity to recycle batteries. Increased battery use by Canadians, combined with investments in new collection channels and recycling infrastructure, offers tremendous opportunity for battery diversion and recovery.

Most of the primary batteries collected in Ontario are sent to Raw Materials Company (RMC) in Port Colborne, Ontario. RMC uses a hydrometallurgical (using water) process to recycle all primary batteries except lithium primary batteries which are sent to Toxco in Trail, British Columbia, where they are recycled using a cryogenic (freezing) process. This program also voluntarily collects rechargeable batteries, which are recycled by RMC, and Ni-Cd batteries are sent to Toxco in Ohio for recycling.

Batteries collected in British Columbia are sent to Toxco, where they are sorted and sent to different processors depending on battery chemistry. Lithium primary and secondary batteries stay with Toxco for processing. The largest portion of batteries from British Columbia and Manitoba are sent to Inmetco in Pennsylvania, where they are put through a pyrometallurgical (thermal) process.

Based on industry data and the RER, the following breakdown by battery and facility (Table 2) illustrates the range of differences in recycling between the different processes and battery types.

## Comparing programs

Comparing programs is difficult because different programs may use different methodologies to provide their best estimate of

## Table 2 | Diversion and recycling rates at approved battery processors

| Battery type | Alkaline | Alkaline | Li-ion | Li-ion | Li-ion | NiMH | NiMH | Ni-Cd | Ni-Cd |
|---|---|---|---|---|---|---|---|---|---|
| Process / Company | Inmetco | RMC | Xstrata | RMC | Toxco | Inmetco | RMC | Inmetco | Toxco |
| Diversion from landfill disposal | 79% | 100% | 71% | 81% | NA | 85% | 96% | 79% | NA |
| Diversion from landfill & road base aggregate/fill | 49% | 100% | 71% | 81% | NA | 68% | 96% | 75% | NA |
| Recycling Efficiency Rate (metals and element recovery) | 41% | 84% | 27% | 56% | NA | 58% | 71% | 63% | NA |
| Disposal | 21% | 1% | 29% | 19% | NA | 15% | 4% | 21% | NA |

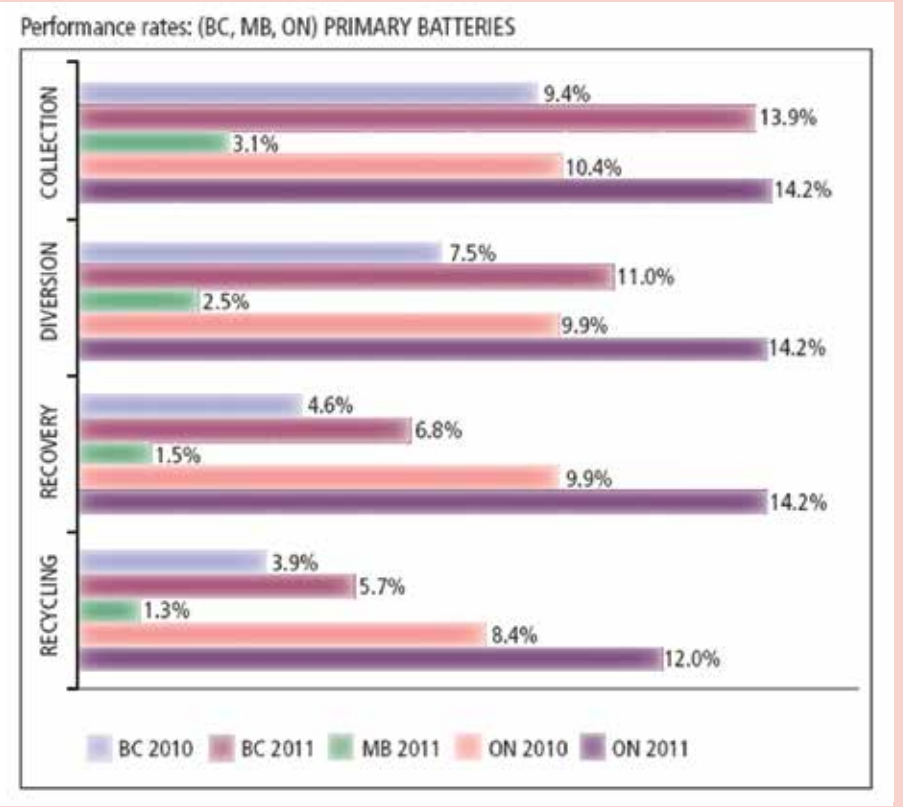
what is available for collection (i.e. the denominator). Indeed understanding the exact number primary batteries and rechargeable batteries that are available for collection (i.e. will be discarded) is not an exact science. Reported per capita "availability" is different province by province, which is not a function of different consumption patterns, rather different data sources and application of hording and life-span assumptions.

On the collection side, in 2011 British Columbia (through Call2Recycle) collected 0.063 kilograms of primary batteries per capita, in addition to 0.011 kilograms per capita in Manitoba. Ontario (Stewardship Ontario) collected 0.079 kilograms of primary batteries per capita – 25 percent more than in British Columbia (Figure 1).

When the RER is applied to collected batteries by program, a clearer picture begins to emerge (Figure 2). Specifically, both British Columbia and Ontario programs have improved significantly since their first year (or half-year) of operation. However, the post-processing recycling rates in British Columbia and Manitoba declined considerably due to their lower recycling efficiencies. Ontario's rate dropped from 14.2 percent (collection) to 12 percent (recycling), and British Columbia's rate dropped from 13.9 percent (collection) to 5.7 percent (recycling), losses which are a result of thermal treatment, a technology able to recover approximately 41 percent of metals and elements.

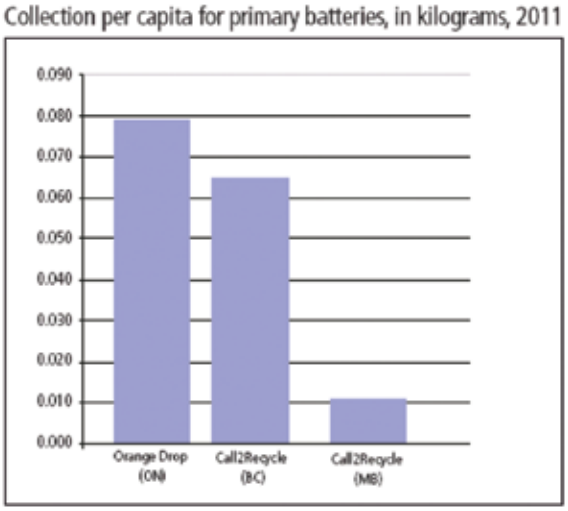
Reports on secondary (rechargeable) battery collection and recycling offers less information, because the types of batteries collected (Ni-Cd, NiMH, Li-ion etc.) are not currently disclosed by stewards, making it impossible to provide a recycling rate. Collection rates for a mixed-bag of rechargeable batteries is approximately 12.5 percent in British Columbia and 9.3 percent in Manitoba.

## Figure 1 | Collection per capita for primary batteries, in kilograms




Source: CM Consulting, 2012

## Figure 2 | Performance rates for primary batteries




Source: CM Consulting, 2012

## A program wrap-up

The 2011 data would suggest that there is still a long way to go to improving our battery collection and recycling rates. British Columbia, Manitoba and Ontario have all set ambitious collection targets for the third year of the program of 25 percent, 25 percent and 30 percent respectively, which means effectively doubling the existing collection performance over one year.

However, the introduction of the Battery Incentive Program (BIP) in February 2011by Stewardship Ontario (the Industry Funding Organization running the program) now offers a financial incentive for collection and processing of batteries. The incentive is designed to support privately initiated collection channels, and it is working.

In one year alone the Stewardship Ontario program, called "Orange Drop," nearly doubled the number of collection sites and also collected significantly more per site compared with the other programs in Manitoba and British Columbia.

Finally, there appears to be clear environmental differences in the recycling technologies – pyrometallurgical versus hydrometallurgical.

Investigation of the lifecycle impacts of these technologies and each facility (including downstream processing) would provide important science-based guidance when determining the proper standards to put in law. ESN

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