Extended Producer Responsibility (EPR)

Current status, challenges and perspectives

MARCH 2008

Développement durable,
Environnement
et Parcs
Québec

PRODUCTION TEAM

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Part I
Executive Summary

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EXECUTIVE SUMMARY

The context

Developed societies generate growing quantities of residual material that are more varied, more complex and more hazardous for the environment than ever before. Municipalities do not always possess the means to develop management programs adapted to these residues, especially when they have to include reduction at source, reuse and eco-design. It is consequently vital that other stakeholders in society support them in this task.

The Québec Residual Materials Management Policy 1998-2008 (The Policy) opened the door to participation by another category of stakeholders through the principle of Extended Producer Responsibility and by stating that the government intended to act to oblige businesses that sell hazardous products to recover and process them at the end of their useful life. The Regulation respecting the recovery and reclamation of discarded paint containers and paints that came into effect in 2001 was the first time Extended Producer Responsibility was embedded in Québec regulations. It was followed by the Regulation respecting the recovery and reclamation of used oils, oil or fluid containers and used filters, which came into effect in 2004.

Definition

Extended Producer Responsibility (EPR) is an environmental policy tool that extends producer responsibility to the post-consumption stage of the life cycles of their products. It is part of the broad family of product management or stewardship programs that, like environmental fees and container deposits, aim at diverting residues from disposal and funding recovery and reclamation programs. EPR has two dimensions to it. The first transfers complete or partial material or economic responsibility upstream, from municipalities to producers. The second is the creation of incentives that encourage taking account of environmental aspects in product design.

The main advantage of EPR is that it provides for minimum government intervention while according producers optimal room to manoeuvre in their choice of how goals are to be met. The role of government is limited to determining target products and producers, basic obligations, objectives or performance indicators to be achieved and ensuring minimal supervision. For their part, producers benefit from freedom of choice with respect to means and partners.

The framework regulation

The framework regulation aims to give body to the will of the government of Québec to continue using EPR with respect to taking charge of various categories of waste. It takes account of the dispositions of The Environment Quality Act (EQA) with respect to EPR that allow for implementing individual or collective programs and seek extended coherence and fairness in the application of requirements to the various target activity sectors. Moreover, it encourages alliances and partnerships, ensures that producers know

in advance the conditions that may be applicable to them through the regulation and ensures improved complementarity between individual and collective programs. In addition, a framework regulation provides the opportunity to update current regulations in the light of experience acquired in recent years.

The current draft regulation has a common stem to which are added various appendices or schedules. The common stem embeds the fundamental principles of the EPR approach. It defines the notion of producers, their responsibilities, accountability as to the achievement of results and reporting obligations. It also defines the following minimum characteristics of recovery and reclamation programs: encourage respect of the 4R hierarchy (Reduction at source, reuse, recycling, reclamation); ensure free access to the recovery system and plan for ongoing information, awareness and education campaigns. The appendices include definitions of target products and across-the board fine-tuning of means applicable to specific programs that may be implemented, over and above or different from general means that appear in the section concerning the common stem. Among such means are program implementation delays, minimum required levels of service, objectives and other performance indicators, mechanisms allowing for establishing available quantities for recovery or reclamation, amounts to be paid if objectives are not met, specific elements to be included in the annual report and annual administrative fees.

Target products

In addition to already-regulated products (paint containers and residue and products from the used oils sector), the framework regulation adds new categories (electronics, mercury lamps and batteries for consumer use). In addition, a sub-category (coolants) is added to those already covered in the regulation with respect to used oils. Other materials may be subsequently added and covered by the addition of new appendices.

Current regulations concerning oils and paints

The Regulation respecting the recovery and reclamation of discarded paint containers and paints and the Regulation respecting the recovery and reclamation of used oils, oil or fluid containers and used filters will be abrogated and appended to the framework regulation. This change, while providing for a more coherent application of EPR from one sector to another within Québec, will also allow for the resolution of certain problems that have been observed during the first years of their application and for clearly designating brake liquids as being within the application purview of the appendix relative to oils.

Electronic products

The electronic products sector is targeted due to the rapid rise in the volume of these products sold and that have consequently reached their end of useful life. It has been estimated that nearly 685,000 computers, 640,000 scanners and printers, 625,000 cellular telephones and 740,000 portable telephones were sold in Québec in 2004. Absent a viable alternative, these products that could be reused or recycled are often disposed of after use, at facilities designed for residual non-hazardous materials, even though many such products contain harmful substances including lead, cadmium, beryllium and mercury. As such, they add significant amounts of recyclable materials to landfills and are also responsible for toxic waste products being released into the environment.

There already exist a number of collection, reuse and recycling systems for electronic products in Québec that involve, among others, the Centres de formation en entreprise et récupération (CFER), the Computer for Schools program, the Horne Foundry and the Noranda CCR refinery. It has been estimated that in 2004, 28% of information and communications technology (IT) devices that had reached their end of useful life were reused, while 7% were warehoused, 6% recycled and 59%, disposed of.

Electronic products subject to the regulation as soon as it comes into effect are desktop and portable computers, computer monitors, routers, servers, printers and ink cartridges, electronic agendas, pocket computers, scanners, fax machines, television sets and classic, portable and cellular telephones. A second regulatory phase will cover electronic game equipment, DVD players, CD players, MP3 and MP4 players, radios, amplifiers, digital video cameras, digital receivers, GPS devices and videotape players.

Mercury lamps

Mercury lamps are targeted because the mercury they contain is a recognized hazardous substance. In addition, these lamps are high performance energy products that are more and more in demand and in their compact fluorescent lamp (CFL) configuration are intended to replace classic incandescent light bulbs that the Government of Canada has announced will be banned in the course of the next few years. It is estimated that more than 80 million incandescent light bulbs will need to be replaced by CFLs, adding to the 14 million mercury lamps sold annually in Québec during the last decade.

In the industrial, commercial and institutional (ICI) sector, recovery and recycling programs that currently exist in Québec are run for their own needs by associations of building owners or by large institutions such as Hydro-Québec. In the residential sector, only the municipal programs that target hazardous household waste (HHW) can serve the Québec population in this regard. In 2004, around 7% of mercury lamps, of which more than 90% were fluorescent tubes, were recycled in Québec. In the residential sector, the rate of mercury lamp recovery is estimated to be less than 5%.

All mercury lamps will be targeted. The most well known are fluorescent lamps including fluorescent tubes and compact fluorescent lamps intended for lighting offices and

residences, as well as high intensity discharge (HID) lamps used to light streets and warehouses.

Batteries

Batteries intended for consumers are targeted for the hazardous heavy metals they contain, including mercury, cadmium and lead, and for their corrosive or reactive properties that give them the characteristics of a hazardous product. Moreover, inasmuch as consumers purchase more and more devices that use rechargeable batteries, sales are rising. Overall, in 2004, nearly 106 million consumer batteries were sold in Québec, of which 95.6% were non-rechargeable batteries and 4.4% were rechargeable batteries.

There is only one program for used battery collection available throughout Québec, offered by the Rechargeable Battery Recycling Corporation (RBRC). The program only applies to rechargeable batteries and otherwise, only municipal HHW programs are in a position to serve a significant portion of the population. In Québec, the estimated recovery rate for non-rechargeable waste batteries was between 2% and 4% in 2004. In addition, only 4.9% of waste rechargeable batteries were recovered and recycled.

All consumer or residential portable batteries are subject to the regulation whether they are rechargeable or not.

Conclusion

EPR is a promising approach and one that guarantees success by affording producers intervention flexibility, offering incentives to improve their environmental performance upstream through product design, and downstream through the application of performance objectives in recovery and reclamation programs that concern their products.

A framework EPR regulation is consistent with the implementation of The Policy and allows for synchronizing this tool for the entire body of targeted producers within Québec while introducing new product categories such as electronic products, mercury lamps and batteries intended for consumers. These products are all sold in growing quantities, are recovered in small numbers by current programs and have a hazardous character. The moment is thus opportune to target them in priority fashion so that consumers can dispose of them adequately at the their end of useful life.

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Part II
The Regulatory Approach

March 2008

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1 THE CONTEXT

Modern societies consume more and more products of all kinds. The residual materials they generate have also evolved in significant ways with respect to quantities produced, composition, diversity, complexity and hazardous content. Municipalities, who have to manage residual materials on their territory, do not have the resources to develop programs that are adapted to the management of this multitude of types of materials. Moreover, they can hardly intervene with respect to reduction at source, reuse or to take account of the principles of sustainable development in the design or manufacturing process. It is thus important for other stakeholders, especially those located upstream from product production and distribution, to take responsibility for the management of their products that have reached their end of useful life.

In Québec, management of residual materials is governed by the Québec Residual Materials Management Policy 1998-2008 (The Policy). This policy is founded on five determinant principles for choosing actions aimed at achieving a 65% across-the-board recovery and reclamation objective for reclaimable residual materials and so reduce by an equal amount the quantity of residual materials sent for disposal, avoiding contamination of the environment and waste of natural resources.

One of the principles of The Policy is Extended Producer Responsibility (EPR), which is an environmental policy instrument that extends the obligations of producers with respect to the products they market to the post-consumption stage of a product life cycle, and encourages producers to become responsible for their products in a “cradle to grave” perspective. In fact, although EPR was initially introduced in order to ensure that producers set up recovery and reclamation services for various consumer products that have come to their end of useful life, this policy can also help to shrink a given product’s ecological footprint in a sustainable development context.

The EPR approach was introduced to Québec environmental regulations in June 2000 through the adoption of the Regulation respecting the recovery and reclamation of discarded paint containers and paints. The regulation came into force in January 2001, and marked the beginning of the implementation of measures stipulated in The Policy aimed at forcing businesses that market dangerous products to recover and process them. This first regulation was followed in October 2004 by the promulgation of the Regulation respecting the recovery and reclamation of used oils, oil or fluid containers and used filters.

Moreover, the regime that compensates municipalities for selective curbside collection, which was implemented subsequent to March 1, 2005, when the Regulation respecting compensation for municipal services provided to recover and reclaim residual materials came into effect, also draws on the GPS principle as did the 1998 transfer to industry of responsibility for the system of deposits on non-refillable beer and soft drink containers.

The will to pursue EPR with respect to the responsibilities for various categories of residual materials and experience acquired in recent years underpins the development of

an EPR framework regulation. This approach is preferred in order to arrive at a clear framework for implementing EPR in Québec and to ensure greater coherence in its application, independently of which products are targeted. The regulation is composed of two parts. The first is a common stem in which is embedded the fundamental principles governing EPR in Québec as well as the means to be used and minimum required features of recovery and reclamation programs. The second contains the appendices that designate target categories of materials or products and details specific requirements and fine-tuned measures particular to each one.

The current regulations concerning paint containers and residues and used oils, oil containers and filters will be abrogated and reintroduced with modifications as appendices to the framework regulation. New categories of designated materials such as electronic products, mercury lamps and batteries will also be included.

This document defines EPR, puts forth the reasons supporting its choice as a policy tool and the fundamental elements, criteria and other features selected by the Ministère du Développement durable, de l'Environnement et Parcs (MDDEP) intended to frame its continued implementation in Québec. It describes the contents of the common stem of the draft regulation and the elements that need to be included in the appendices in which category and product particularities will be included as well as a list of potential future target category additions. Finally, the category- or product-specific guidance documents regarding the appendices to the framework regulation are themselves appended to this document.

2 THE DEFINITION OF EXTENDED PRODUCER RESPONSIBILITY

EPR is part of the greater family of management or stewardship tools that includes other economic policy instruments such as environmental levies and deposits. These programs aim at diverting residual materials from disposal to reduce waste of resources while ensuring adequate funding for the creation and employment of various forms of recovery and reclamation. However, EPR has a number of features that go beyond the principle of "polluter pays" or "user pays."

In 1994, the OECD began a project that looked at EPR and eventually issued directives intended for governments seeking to implement such programs. In 2001, this body published *Extended producer responsibility – A Handbook for Governments* that defines EPR as "an environmental policy instrument that extends obligations of producers with respect to their products to the post-consumption stage of their life cycle" with two essential interdependent dimensions:

- Upstream transfer of total or partial material or economic responsibility from municipalities to producers;
- Creation of incentives encouraging producers to take environmental considerations into account when designing products.

Responsibility for managing products at the end of their useful life is thus transferred from municipalities to producers. Producers are encouraged to take a new across-the-board look at the design of their products so as to reduce their toxicity, improve their end of useful life dismantling and reclamation potential, lower processing costs and achieve prescribed reclamation objectives. EPR is founded on the fact that producers are best placed to determine recovery and reclamation strategies that are appropriate to their own products and markets and develop innovative solutions.

EPR can also be defined by its three constituent terms:

- Producer – Designates the highest upstream decision-making centre related to product design and marketing in a given territory.

- Responsibility – Implies that producers assume their fair share of post-consumption system management responsibilities. This is a direct, explicit responsibility and does not simply mean, for example, measuring the indirect effects on its sales volume of environmental measures such as recovery and reclamation. The responsibility must be financial, operational, even technical, and must render producers answerable to and accountable for results.

- Extended – Extended responsibility is not, however, the same thing as complete responsibility, which would mean that producers assume all post-consumption management costs including costs for the disposal of products that are not brought back to a recovery system. In an EPR program, municipalities remain responsible for the portion sent for disposal. This approach means that producers are not responsible for the behaviour of consumers who do not return their products that have reached their end of useful life despite the existence of an adequate management program.

3 ADVANTAGES OF EXTENDED PRODUCER RESPONSIBILITY

The advantages of EPR are many, as much for the environment as for government and producers. In point of fact, this approach demands minimal human resource commitment on the part of government and allows for considerable flexibility with respect to the means that producers can employ to meet regulatory requirements. The main advantages for governments and producers are as follows.

- The role played by government is limited to:
  - ✓ Determining target products and producers;
  - ✓ Determining basic obligations;
  - ✓ Determining objectives and performance indicators;
  - ✓ Determining minimum program framework implementation;
  - ✓ Follow-up to ensure that objectives and other performance criteria are being met.

- Producers benefit from:
  - ✓ Choice of means employed;
  - ✓ Choice of partners;
  - ✓ Flexibility and adaptability of programs;
  - ✓ The possibility of working in concert with other designated sectors.

Other advantages of EPR are worthwhile mentioning:

- ✓ It reduces the volume of materials sent for disposal;
- ✓ It allows for improved control of hazardous materials management and their disposal when reclamation is not possible;
- ✓ It encourages better product design with respect to environmental impact;
- ✓ It lightens municipal material and financial burden with respect to residual materials management;
- ✓ It puts the responsibility for achieving results on the shoulders of those who benefit from the sale of target products;
- ✓ It places the responsibility of the costs of reclamation on producers and consumers of target products rather than on the entire body of tax-payers;
- ✓ It promotes a more rational use of natural resources.

4 THE EUROPEAN, CANADIAN AND QUÉBEC APPROACHES TO EPR

4.1 The European approach

The definition as proposed by the OECD is very broad and accommodates many variants of EPR, worldwide. By giving it their own, national definition, many industrialized countries have already incorporated EPR into their laws and regulations. The European Union has been a leading force in this respect, having already adapted directives (see box) that impose obligations on producers running from financing collection and recycling systems to stringent requirements for ecodesign and product contents. In all of these cases, producers are responsible for all aspects of collection and recycling programs, including financing.

European Directives

- Directive 2002/95/CE of the European Parliament and of 27 January, 2003 of the European Council, relative to limits on use of certain toxic substances in electrical and electronic equipment
- Directive 2002/96/CE of the European Parliament and of 27 January, 2003 of the European Council, relative to waste electrical and electronic equipment (WEEE) – Joint declaration of the European Parliament, the Council of Europe and the European Commission with respect to Section 9
- Directive 2006/66/CE of the European Parliament and of September 6, 2006 of the European Council with respect to batteries and accumulators as well as battery and accumulator waste, abrogating directive 91/157/CEE

- Directive 2000/53/CE of the European Parliament and of September 18, 2000 of the Council of Europe with respect to out of service vehicles
- Directive 2005/64/CE of the European Parliament and of October 26, 2005 of the Council of Europe concerning reception by type of motor vehicle with regard to possibilities for their reuse, recycling and recovery, modifying directive 70/156/CEE of the Council

Until now, European legislation restricted the principle of extended responsibility to producers of products or product categories such as batteries, motor vehicles and electrical and electronic equipment. However, in February 2007, the European Union proposed an amendment to the proposed directive of the European Parliament and of the Council relative to waste[1] that could broaden extended producer responsibility to the across-the-board management of residual materials.

4.2 The Canadian approach

EPR and other types of stewardship for products at the end of their useful life is well under way in Canada. Since management of residual materials is a provincial responsibility, there may be varying interpretations of the notion of EPR, which can lead to some confusion. For its part, Environment Canada defines EPR as an "increase in conventional producer and distributor environmental responsibility, over and above what was formerly expected" so as to include the stage of post-consumption management. While retaining the criterion of continuous producer/distributor intervention, this definition of EPR tries to remain flexible enough to apply as much to ordinary resellers as to manufacturers and brandowner. In that sense, the Environment Canada inventory of stewardship and EPR programs treats as EPR, programs whose funding comes from fees or levies set by government that are collected directly from consumers as taxes and managed by an organization designated or created by government, while the only connection to entities that are involved in marketing is collection of the environmental fee by resellers of target products. This is the case for electronic products in Alberta. Producer responsibility may also be indirect, as in the case of a program financed by a deposit system and run by an industry created not-for-profit organization or by government. Moreover, Environment Canada takes the position that the stewardship approach implies that all stakeholders share in these responsibilities, not just the one that has material control of a product at a given moment in time. In light of this very flexible interpretation of EPR and product stewardship, Environment Canada has prepared an inventory of existing and upcoming Canadian programs.[2] Legislative measures that are

[1] Commission de l'environnement, de la santé publique et de la sécurité alimentaire. *Draft de résolution législative of the Parlement européen sur la proposition de directive of the Parlement européen et of the Conseil relative aux déchets* (COM(2005)0667 – C6-0009/2006 – 2005/0281(COD http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+REPORT+A6-2006-0466+0+DOC+XML+V0//FR

[2] Environment Canada. *Extended producer responsibility and stewardship* http://www.ec.gc.ca/epr/default.asp?lang=En&n=A089CC28-1

the foundations of such programs and recently proposed programs are shown in Table 1, sorted by province.

It is true that there are some differences both between provinces and within provinces with respect to their regulatory approach to EPR and stewardship. Recently, however, British Columbia, Manitoba and Ontario have either adopted or proposed an EPR legislative framework that should allow for ensuring uniformity in their programs.

Moreover, looking to better seat the definition of EPR as proposed by the OECD and foster a more harmonious implementation in Canada, the Canadian Council of Ministers of the Environment (CCME) has set up an EPR working group in which the MDDEP participates. In addition, in June 2007, the CCME adopted a series of Canada-wide principles aiming to support EPR implementation throughout the country. In particular, these principles stipulate that, "stewardship processes and programs or regulations relating to them may be considered as EPR programs as long as they respect EPR principles." These principles are detailed in the box below.

Table 1. Legislative Measures based on EPR or Stewardship, adopted or proposed by Canadian provinces

Province	Law, regulation or draft regulation	Year	Target product category	Approach according to Environment Canada[1]
British Columbia	*Recycling Regulation*	2004	Various products[2]	EPR Framework Regulation
Alberta	*Electronics Designation Regulation*	2004	Electronic products	EPR
	Tire Recycling and Management Regulation	1992	Tires	Stewardship
	Beverage Container Recycling Regulation	1997	Beverage containers	EPR
	Lubricating Oil Material Recycling and Management Regulation Act (AR 82/97)	1997	Oils	Stewardship
Saskatchewan	*Waste Electronic Equipment Regulations*	2006	Electronic products	EPR
	Waste Paint Management Regulations	2005	Paints	EPR
	Scrap Tire Management Regulations	1998	Tires	Stewardship
	Used Oil Collection Regulations	1996	Oils	EPR
	Litter Control Designation Regulations	1998	Beverage containers	EPR
Manitoba	*Proposed Hazardous or Prescribed Household Material Stewardship Regulation*	2007	Various products[3]	EPR Framework Draft Regulation
	Regulation on tire management *Draft regulation on tire management*	1995 2006	Tires	EPR
	Regulation on used oils, oil filters and oil containers	1997	Oils	EPR
Ontario	*Waste Diversion Act*	2002	Various products[4]	EPR framework law
Québec	*An Act respecting the sale and distribution of beer and soft drinks in non-returnable containers,*	1984	Beverage containers	EPR
	Regulation respecting the recovery and reclamation of used oils, oil or fluid containers and used filters	2004	Oils	EPR
	Regulation respecting the recovery and reclamation of discarded paint containers and paints	2000	Paints	EPR
	Balanced Budget Act– Introduction of an environmental fee at time of new tire purchase	1999	Tires	Stewardship
	Regulation respecting compensation for municipal services provided to recover and reclaim residual materials	2005	Packaging and printed matter	EPR

Province	Law, regulation or draft regulation	Year	Target product category	Approach according to Environment Canada[1]
New Brunswick	*Tire Stewardship Regulation - Clean Environment Act (N.B. Reg. 96-82)*	1996	Tires	Stewardship
	Used Oil Regulation - Clean Environment Act (N.B. Reg. 2002-19)	2002	Oils	EPR
	Beverage Containers Regulation	1999	Beverage containers	EPR
Nova Scotia	*Solid-Waste-Resource Management Regulations*	1996	Tires Paint Beverage containers	Stewardship
	Used Oil Regulations	1995	Oils	EPR
Prince Edward Island	*Litter Control Regulations*	1991	Beverage containers	EPR
	Used Oil Handling Regulations	1992	Oils	EPR
	Lead Acid Battery Regulations of Prince Edward Island	1993	Batteries	Stewardship
Newfoundland and Labrador	*Used Oil Control Regulations*	2002	Oils	Stewardship
	Waste Management Regulations	2003	Beverage containers Tires	Stewardship

1. The interpretation of the meaning of stewardship and EPR varies among the federal, provincial and territorial governments.
2. Designated: electronic products, tires, beverage containers, used oils, used oil containers, oil filters, paints, pharmaceutical products as well as flammable liquids, solvents, residual pesticides and fuels. Designation envisaged for 2007: two products from among the following: antifreeze, hydraulic fluids, household batteries, products containing mercury (light bulbs, switches, thermometers, medical equipment), packaging, small appliances, chemicals intended for use in swimming pools and photography, furniture and textiles, construction and demolition residues, automobiles.
3. Designated in the draft regulation: motor vehicle antifreeze and batteries, paint, fluorescent tubes and compact fluorescent lamps, pesticides, pharmaceutical products, hazardous household waste.
4. Designated: residual materials intended for the blue box, used tires (not applied, used oils (not applied), electronic and electrical products (list revised), hazardous and special household wastes. Phase 1: paint and paint containers, solvents and solvent containers, oil filters and oil containers, primary batteries, antifreeze and antifreeze containers, pressurized containers, fertilizers, fungicides, herbicides, insecticides, pesticides and pesticide containers. Phase 2: secondary batteries, aerosol generators, portable fire extinguishers, fluorescent tubes and compact fluorescent lamps, pharmaceutical products, syringes and sharp-edged materials, mercury switches, thermostats, thermometers, barometers and other measuring devices containing mercury.

Principles of the CCME – Extended Producer Responsibility

1) As much as possible, programs are designed to reduce the impact of products on the environment.

2) EPR programs are to respect the 4R hierarchy in waste management:

    a) reduction, including reduction in toxicity, and reformulation of the product so as to improve its reusable or recyclable features;
    b) reuse;
    c) recycling;
    d) recovery of materials and/or energy.

3) EPR programs encourage producers to integrate ecodesign into their production processes so as to minimize the impact of their products on the environment and on human health.

II. Principles related to program design

4) EPR programs transfer responsibility for products or materials that have reached their end of useful life from municipalities or other waste management authorities to producers.

5) Potential programs are subject to in-depth analysis in order to determine if they can become EPR programs and to define the roles of the various players in the chain of production.

6) Policy instruments are flexible and chosen on a case by case basis.

7) Local administrations and other stakeholders participate in discussions on priorities, environmental objectives and environmental performance evaluation and are solicited in order to improve program acceptance and efficiency.

8) Preparation and implementation of EPR programs and policies take place with full transparency.

III. Principles of implementation

9) Programs and policies are designed and implemented so as to maximize environmental advantages and keep economic disruption to a minimum.

10) A communications strategy is prepared with a view to keeping all players in the chain of production, including consumers informed, and to obtaining their cooperation.

11) EPR programs are periodically evaluated to verify their proper functioning and performance and include accessible and clear procedures for reporting.

12) Program management costs are not shouldered by the entire body of taxpayers.

13) In order to maximize recovery, consumers enjoy reasonable and free access to collection systems.

4.3 The Québec approach

Extending the general definition proposed by the OECD, respecting the principles set out by the CCME and in the light of a review of preferred approaches in other jurisdictions and Québec experience since 2001, the MDDEP has worked to prepare the set of principles and rules that should apply in framing EPR implementation in Québec. From this process of reflection emerged the project of preparing a regulation to clearly establish an equitable and coherent framework with respect to timing and target categories of materials or products that will optimize the planned benefits to the environment.

Section 53.30, paragraphs 6 a) and 6b) of Québec's Environment Quality Act (EQA) empowers the government to regulate with respect to extended producer responsibility. In more specific terms, the government may regulate to:

"require any class of persons, in particular those operating industrial and commercial establishments, which manufacture, market or otherwise distribute containers, packaging or packaging materials, printed matter or other products, to develop, implement and contribute financially to, on the conditions fixed, programs or measures to reduce, recover or reclaim residual materials generated by the containers, packaging, packaging materials, printed matter or other products, or generated by their activities."

Moreover, Section 53.30, paragraph 7 of the Act permits the exemption from all or any of the regulatory requirements of any person that is a member of an organization the function or one of the functions of which is to implement or to contribute financially towards the implementation of a system to recover or reclaim target materials or products, in accordance with an agreement between the organization and the Société québécoise de recuperation et de recyclage (RECYC-QUÉBEC). Finally, the last paragraph of Section 53.30 stipulates that the provisions of any such agreement must allow recovery and reclamation levels to meet or exceed the levels that would be achieved through the application of the regulatory standards and that the Minister may prescribe conditions on which such agreements may be approved and determine the minimum content thereof.

Within Québec, entreprises whose products are subject to EPR can thus implement so-called individual programs distinct to their own situations or set up so-called collective programs run by organizations created or funded by a grouping of enterprises and accredited by RECYC-QUÉBEC.

This legislative context provides for the establishment of fundamental principles and rules of application that ensure coherence, equity, efficiency and clarity for all affected authorities.

4.3.1 Fundamentals

The fundamental principles described below must be reflected in Québec's EPR regulation and any derivative recovery and reclamation programs, whether individual or collective.

- The notion of producer

The term "producer" refers to owners, holders or users of a brand, name or distinctive trademark associated with a marketed product. When no such owner, holder or user exists within Québec, responsibility falls to the foremost or first supplier of the product within the territory. This regulatory definition aims to cover persons at the highest level of the marketing or distribution chain of a particular product in Québec. For example, if it proves impossible to directly reach persons responsible for the design of a designated product, responsibility falls to those persons who choose to introduce the product to the territory of Québec. In this regard, a first supplier may be an importer, a wholesaler, a distributor, a chain or a grouping of stores or even a single retailer. It is even possible that there might be more than one first supplier of a given brand. However, subject to clearly defined regulatory or contractual rules, it is possible to envisage cases where groupings of first suppliers of a single brand or producers outside of Québec may voluntarily act on behalf of first suppliers of their products within Québec.

A manufacturer of component parts of a designated product or of the product itself or a workshop where the product is assembled does not constitute being a producer or first supplier if its role is restricted to that of supplier to a third party and having no marketing or distribution responsibility for the finished product. For example, a manufacturer of paint sold under various brand names is only subject to responsibility for quantities sold under brand names that it owns or of which it is a user; in the same way, manufacturers of computer parts that are used by other brand owners in the assembly of a branded finished product are not targeted.

Finally, a producer may be subject to the regulation both because of its status as brandowner of a designated product and its status as first supplier of a designated product that belongs to a third party, whether such party is established in Québec or not, as long as the product has been acquired outside of Québec. Moreover, an entreprise established in Québec or active in Québec and that acquires designated products outside of Québec for its own use is considered to be a producer.

- The notion of responsibility

Under EPR, producers are directly and completely responsible for preparing, submitting for approval, implementing, exploiting and financing a recovery and reclamation system for designated products similar to those it markets and for information, awareness and education activities intended to ensure consumer support and achievement of objectives. Producers are also responsible for research and development intended to optimize the reclamation segment of their activities and maximize environmental gains that flow from

this. They are required to inform competent authorities of any changes to their system and to report yearly on their activity and on results obtained, and to propose any corrective measures as may become necessary.

In the case of a collective system whose implementation and management are the responsibility of an accredited organization, producer-members are collectively responsible for ensuring the efficiency and performance of the system and for verifying that regulatory norms and other accreditation conditions are met by the organization.

Producers are responsible for choosing the means they wish to employ and eventual partners in such systems. However, as citizens see municipalities as key players with respect to the management of residual materials, producers are responsible for keeping municipalities appropriately informed of their programs and their evolution over time. Moreover, programs should be designed to facilitate municipal participation as partners.

- The notion of product

All programs or systems established pursuant to EPR regulations must provide for recovery and reclamation of all and any designated products similar to those sold in Québec by the producer or producers in question without regard to brand or its source within Québec.

The notion of product extends to all and any components of a designated product that are indivisible from it during normal functioning and discarded as part of the product or along with it. This is the case, for example, for cables discarded with a computer or a rechargeable battery discarded with a cellular telephone. These products are considered as part and parcel of the computer or cellular telephone and as such, must be accepted and processed by the recovery and reclamation program. However, when a component part of a product is also a specifically designated product in another appendix to the regulation, in its own right, producers that recover such components as part of the products they market remain responsible for them and must remove and account for them separately. They may, however, consign them for purposes of processing to the producers subject to the other appendix under conditions negotiated between the two parties. For example, rechargeable batteries recovered from portable computers by computer producers may be consigned to programs for which battery producers are responsible. In their annual reports, both programs must, however, clearly mention the transfer.

- The notion of service area

Since EPR implementation generally speaking translates into post-consumption management costs for designated products being transferred to consumers, fairness and across-the-board appropriate management within Québec of all designated products that have reached their end of useful life, dictate that recovery and reclamation programs take into account all territories where such products are sold or otherwise distributed. To that end, minimum service levels that take account of specificities of various Québec areas and their populations will be included in the appendices.

- Setting objectives

In addition to helping to achieve the overall objective of The Policy, establishing objectives proper to each appendix acts as an incentive to producers to implement systems that work well, are adapted to the needs of consumers of their products and to those of individual regions, and include appropriate informational, awareness and educational activities. This may take the form of a target to be met within a given time frame accompanied by an ongoing improvement index, or other types of performance indicators, such as waste reduction and recovery increase at the end of the dismantling process.

In addition, when objectives are not met, penalties may be imposed as performance incentives. However, such incentives should not replace the requirement to revisit programs and systems in place or encourage producer performance disengagement. Any penalties that seek to reduce the spread between achieved results and performance targets should be modulated with respect to the size of the spread, and increase over the years if the problems persists.

- Mandatory reporting

Producers must report on the results of their recovery and reclamation programs and are held to a standard of transparency. Producers must also use outside experts to validate information submitted concerning management of their programs. They must analyze their weaknesses and propose solutions. They are also responsible, in all stages of their programs, for verifying that any and all persons acting on their behalf who take charge, in whole or in part, of recovered products, act in accordance with all regulatory dispositions and other applicable agreements as well as respecting best known practices. This requirement extends to the stage of selling consolidated or processed materials for disposal or manufacturing processes.

4.3.2 Minimum recovery and reclamation program features

Minimum features are characteristics that must be met by all individual or collective recovery and reclamation programs set up pursuant to an EPR regulation.

- Program implementation

Producers will have between six and eighteen months to prepare and implement recovery and reclamation programs for designated products from the time the regulation comes into effect. Interim delays will be set to allow producers to advise the Minister of their intentions to take advantage of the exemption, join an accredited organization and submit information concerning the establishment of the program. If some products in a single appendix are designated on a time-staggered basis, recovery and reclamation programs applicable to products targeted in later stages must be effective as of the in-force dates stipulated in the appendix.

- The 4R hierarchy

Products must be managed so as to encourage respect for 4R hierarchy, i.e., in order, reduction, reuse, recycling and recovery whether energy or other. Exemptions from this hierarchy must be founded on the demonstration within the Québec context that they offer environmental gains or that acting otherwise is neither technically nor economically viable. Life cycle type studies are a key tool for supporting such demonstrations.

- Free and unrestricted access to recovery services

Recovery programs must include a certain number of collection sites for the recovery of target products. Access to these sites must be free for all Québec generators of designated products without regard to source of such products or their generators (residential/municipal or institutional, commercial and industrial [ICI]). Moreover, these collection sites must accept all similar products to those marketed by a given producer, subject to thresholds of quantity, size or other characteristics stipulated in the regulatory appendices. With respect to products that are usually delivered due to their size and when products that have reached the end of their useful life are generated in large numbers, as is often the case for generators in the ICI sector, programs may divert these to certain collection sites that have been adapted for receiving such quantities or use a free or reasonably-priced collection service that encourages generators to use it instead of other options that may be available. In this manner, all collection sites need not be set up to recover large volumes while certain programs provide an adequate number of such collection sites or on-demand equivalent services for each regional municipality, and to which other collection sites may send such materials.

The requirements of the regulation must however by sufficiently flexible to allow for special approaches to recovery, for example using the postal service. Moreover, collections made directly at clients' premises on a regular timetable pursuant to a private business relationship are not taken to be collections points. Any and all producers that sell or otherwise distribute designated products solely to industrial, commercial or institutional clients for their own use, and that offer them a direct recovery service are not required to open collection sites accessible to all users of similar products.

- Modulation of costs and ecodesign

The methodology used to determine costs applicable to collection and recovery of a product must gradually incorporate factors allowing to modulate these costs as a function of the product's characteristics with a view to encourage ecodesign criteria such as reduction in toxic materials, use of recycled materials, nature of materials used, dismantling facilities and extension of product life. This modulation permits and acknowledges efforts of producers to shrink the ecological footprint of their products and induce others to follow in their footsteps. This approach is already used in the compensation regime for municipalities to support recovery services. In this case, entreprises required to contribute to the funding of the regime must use a fee formula that evolves with time to reflect the environmental characteristics of products sold in the marketplace. Moreover, any potential drop in the sales price of "greener" products due to a favourable modulation of costs could induce consumers to prefer products that are less harmful to the environment.

Deciding which criteria to use in determining the environmental qualities of a given product is a complex process. Therefore it is expected that initial criteria will be simple and limited in number and will evolve over time. For example, an electronic product that conforms to the European directive relative to limitations on certain hazardous substances in electrical and electronic equipment (RoHs directive) may benefit from a lower basic cost set for the product while the basic cost for a similar product that does not conform to the directive may rise.

- Prohibition of cross subsidization between types or categories of products

Costs associated with recovery and reclamation of a given type of designated product must reflect post-consumption management costs for this type of product. A program may not attribute partial or total management costs for one product type to another product type, nor may overall costs of a recovery and reclamation system with respect to one product type within a category be allocated to the entire category as a whole. However, a program may group certain costs relative to products that are sold indivisibly, such as paints and containers.

The sole exception to this rule concerns allocation of post-consumption management costs of historical or orphan products.

- Internalization of costs

Costs generated by the implementation of recovery and reclamation programs must be incorporated into the sales price of designated products in the same way as other costs of production (manufacturing, health and safety, transport, marketing, etc.). Cost internalization, moreover, constitutes one of the sixteen principles of the Sustainable Development Act adopted in January 2006, as does the principle of "polluter pays."

> "Internalization of costs: The value of goods and services must reflect all the costs they generate for society during their whole life cycle, from their design to their final consumption and their disposal."

Internalization of costs also seeks to avoid perpetuating the notion that for a given product, end of useful life management costs, especially with respect to protection of the environment, constitute a cost that is external to the consumption of the product. Internalization thus fosters the development of a mentality based on a product's life cycle.

- Costs incorporated into selling prices

Incorporating costs into selling prices is indivisible from internalization and modulation of costs as regards the acknowledgement of previously mentioned factors of ecodesign. Furthermore, given the multitude of designated products per category and the possibility that numerous recovery and reclamation programs may be implemented with respect to the same category of products, a single approach to costs integration will avoid confusion and errors. Additionally, the use of a separate invoice line to show the amount of post-consumption management cost for a given product is prohibited.

An integrated cost approach does not mean, however, that producers are prohibited from informing their clients that part of the purchase price of the product goes to support a recovery and reclamation program, through posters or lists available in stores or in packaging or support documents accompanying the product. Still, if it is true that displaying post-consumption management costs can contribute to making some consumers aware of the existence of recovery programs, there is no proof that this is anything but marginal to the need for appropriate informational and awareness activities required to ensure consumer support in the weeks, months and years following the purchase and for keeping them informed as to the recovery choices available to them.

- Information, awareness and education (IAE)

Recovery and reclamation programs must have an IAE component that includes specific objectives and an implementation timetable. Its deployment must include reaching the various clients that generate designated products. These IAE activities aim at informing consumers of the reclaimable nature of the products and of the environmental advantages of good end of useful life product management. In particular, they must allow for the existence of the implemented recovery and reclamation system to become known, especially as it concerns accessibility to collection sites. In their annual reports, producers must detail all IAE activities made during the year, evaluate their efficiency and, as needed, propose a modified IAE plan that will ensure participation of the population and achievement of objectives.

- Research and development (R&D)

All recovery and reclamation programs must stipulate proposed efforts towards contributing to the development of techniques for processing and reclamation of recovered materials and markets being considered for their sales in a perspective of favouring the 4R hierarchy and optimizing gains to the environment. More specifically, such programs must stipulate objectives and proposed R&D performance evaluation criteria as well as a results timetable. Annual reports must include information on R&D activity during the period, benefits stemming from them and efforts to improve future performance.

- Supplier requirements

All recovery and reclamation programs must include mechanisms for establishing rules of functioning, criteria, and requirements with respect to the type, quality and extent of services rendered that are to be followed by the various suppliers to the program (vendors' qualifications). Such mechanisms must allow for ensuring that suppliers comply with applicable regulatory standards, all conventions and agreements, as well as best known practices in the accomplishment of the tasks they are given. Moreover, established requirements must allow tracing of recovered, consolidated, packaged or otherwise processed materials to the point when they are sold as inputs to a manufacturing process.

- Annual report, statement and five-year revision

All recovery and reclamation programs must submit annual reports that comply with regulatory requirements. Reports must state what quantities of each product type were sold, describe the recovery system, stipulate quantities recovered, reclaimed, transferred or disposed of, processing means and methods, suppliers, IAE and R&D activity, etc.

Furthermore, all recovery and reclamation programs must submit a quantitative and qualitative statement on each five-year anniversary of their initial implementation. Statements must allow conclusions to be drawn as to the evolution of the program status, indicate which program elements function properly, stipulate any problems or irritants and propose solutions to observed problems including any desired regulatory modifications. They must also set out program guidance, priorities and preferred measures for the following five years.

- Administration fees

Legislative framing of EPR implementation regulation has resulted in individual program case files having been processed by the MDDEP, while collective programs managed by accredited organizations are processed by RECYC-QUÉBEC. To ensure fairness towards accredited organizations that pay administrative fees to RECYC-QUÉBEC on terms established in the accreditation agreements, measures are called for to require individual program case file analysis administration fees. These fees may be fixed or set as a

percentage of recovery and reclamation program management costs, annuals sales by volume or annual dollar sales in Québec.

5 SPECIAL ISSUES

Preparing and implementing an EPR regulation poses certain challenges despite the significant advantages that it provides. The principal problem issues are outlined below. Their solutions will vary according to product category and characteristics proper to their sales, usage and consumer discard habits. Generally speaking, they are set out in the appendices.

➥ Setting realistic and controllable objectives while encouraging performance

The Policy set a 2008 target of 65% as a quantitative objective for overall reclamation of potentially reclaimable residual materials, calculated by weight. It also stipulated a number of objectives concerning the municipal, ICI and construction-renovation-demolition sectors (CRD). However, these objectives are sometimes ill adapted to the realities of EPR implementation. They do not cover all types of residual materials generated and are calculated on the basis of their source. As well, weight criteria do not always adequately reflect true performance because of, for example, product evolution, as in the electronic sector where products tend to be lighter all the time. Moreover, the introduction of other performance indicators may present undeniable environmental advantages. In the case of mercury lamps, for example, higher levels of recovered mercury would be a more significant indicator with respect to the protection of the environment than an increase in the number of lamps recovered compared to estimates on total quantities available for recovery.

One can posit three types of situations for which different approaches are required for determining objectives. The first concerns products like alkaline batteries and oil filters that are discarded whole and for which there is no possible reuse. In this case, it is reasonable to set an objective based on a proportion of the number of units sold (or equivalent weight) by product type. However, if some of these products are short-lived (less than two years on average), others may be kept for from three to five years or more before being discarded. Such cases call for a mechanism to determine an earlier reference year so as to establish the product sales levels to which objectives are to apply. Moreover, inasmuch as some of these markets are emerging and in constant evolution, a mechanism is required for revising objectives over time.

The second situation also concerns products with short lives where a part of the product disappears with use, and where consumers may keep quantities that are potentially available for recovery for the medium or long term. A good example of this is paints and motor oils. This product type requires that a mechanism or methodology for establishing quantities available for recovery be provided in the regulation. Regulatory targets would then be applied to calculated available quantities.

The third situation applies to products that have a functional life generally in excess of two years and are relatively costly. Many consumers discard these products before they are really unusable, and as they are often reusable, they are diverted to other uses outside of official channels. They may also be often warehoused for various lengths of time, either in the hope of turning some eventual profit or because of a lack of adequate disposal solutions. This is notably so for most electronic products like computers and television sets. It is very difficult to estimate unit quantities or weights available for recovery with respect to these products for reasons already explained, but also due to the fact that it is not possible to foresee what proportion of annual sales constitutes replacement as opposed to new equipment acquisition. Furthermore, these types of products evolve rapidly, and it is inappropriate to make comparison by weight for units sold 3, 5 or even 10 years ago to units currently on the market.

Concerning this last situation, the envisaged solution is to establish minimum performance levels through regulation, and combine this with an ongoing improvement approach spread over a period to be determined. The determination of minimum levels for each product category or type will require some study. As for the mechanism used to periodically and subsequently set targets, the appendix should prescribe that a committee to make recommendations to government be struck, with membership from producers, the MDDEP and RECYC-QUÉBEC. This approach would have the advantage of allowing for the acquisition of knowledge commensurate with the establishment of realistic objectives that foster performance, while being well adapted to the realities of the target product markets.

The calculation of objectives can be based either on rate of recovery or on rate of reclamation. It is suggested that a rate of recovery be selected, accompanied by the requirement to reclaim as much of recovered materials as possible, while conforming to other previously mentioned applicable dispositions including 4R hierarchy, supplier quality requirements and product tracing.

As a rule, it is preferable to favour performance with respect to the recovery of products that are the most harmful to the environment. However, inasmuch as it is also important to see to the recovery of less harmful but more widespread products in order to avoid waste of resources, it is also necessary to prohibit compensating weak performance with respect to one product type by the transfer of a superior performance concerning objectives set for another product in the same category, subject to demonstration of advantage to the environment.

➥ Reuse

Reuse refers to the repeated use of a product without modifying its appearance or properties. An example would be when a functioning computer is supplied to a third party. Reuse constitutes a form of reclamation in the sense that it extends the useful life of a product and contributes to reducing consumption by avoiding or delaying acquisition of a new unit. Quite often, reuse takes place in an unofficial and uncontrolled context. In

addition, since most reused products will be eventually discarded, it is advisable to attempt to take this reality into account when determining quantities that are available for recovery or the sales year of reference when applying objectives.

Reuse can also support valid socio-economic activity or allow for planning social reintegration while easing access for certain segments of society to products that would be otherwise difficult to obtain. Additionally, to conform to 4R hierarchy, EPR programs that concern designated product categories that may be of interest for reuse should include activities that favour recovery and diversion of products of interest to reuse channels. Annual reports should stipulate any action taken in this regard. With respect to quantities diverted to reuse, there exists a risk of counting recovered quantities twice. The draft regulation should establish a mechanism here to allow for taking such reuse into account. However, producers need not be required to manage or fund reuse channels, on the one hand in order to ensure that program management charges collected on the basis of initial product sales do not cover processing of the same product more than once, and, on the other hand, because products diverted for reuse do not constitute products that have reached their end of useful life subject to EPR requirements. As such, used products offered for re-sale or otherwise redistributed are not subject to the regulatory dispositions.

➥ Historical and orphan products

Historical products are defined as products of the same type as those targeted by the regulation that were sold prior to its coming into effect and were consequently not sold at prices that took into account the recovery and reclamation system funding. Orphan products refer to items made by producers who are no longer active.

In a perspective of protection of the environment, it seems essential that all historical and orphan products that are similar to those designated by regulation be accepted in EPR programs. It is worthwhile remembering here that in exchange for costs related to the management of historical products, new products sold under the purview of program management costs will not be available for recovery for some time and this lead time provides some financial manoeuvring room. Furthermore, for short life cycle products, the impact of historical and orphan products will be limited and there is no need to have special dispositions concerning their integration to recovery and reclamation programs.

➥ Freeriders and Internet sales

Once the regulation comes into effect, questions relating to freeriding will arise, since certain producers who do not comply with the new regulatory requirements will nonetheless benefit from services offered by recovery and reclamation programs set up and funded by other producers. As it is generally speaking difficult for a government authority that is outside the target sector to locate any and all persons subject to the regulation and to exercise follow-up, third party denunciation is an important source of information that could lead to infraction reports and penal charges.

The question of freeriding becomes more complex when consumers purchase products without going through an intermediary that is established in Québec, for example, Internet or telephone purchases. However, a study commissioned by the CCME[3] found that in fact, freeriders that employ virtual sales networks are small-scale producers having little market impact. Experience shows that upwards of 90% of the on-line market is composed of large-scale producers that generally comply with regulations. There is thus every advantage in seeking to convince large corporation to join the system and consequently obtain information concerning their on-line sales. Nonetheless, in a spirit of fairness to all producers, it is advisable to work cooperatively with other governmental authorities such as Revenu Québec in order to find solutions to this problem.

➥ Product "slippage" between brandowners and foremost suppliers

Within the current regulatory context, some quantities of products sold may be accounted for in no producer's annual report. This kind of situation may occur when a brandowner established in Québec only declares branded product quantities identified as having been sold in Québec. But a portion of products sold outside Québec can be reintroduced to the Québec market by other suppliers that are not required to declare, pursuant to current regulations. To counter this situation, it would be advisable to require all producers (brandowners and first suppliers) to declare, in addition to quantities sold under their own brands, the quantities of all brands acquired outside Québec for resale or for their own use.

➥ Definition of the notion of Québec establishment or domicile

Within the current regulatory context, any enterprise that markets a designated product under a brand that it owns or of which it is an authorized user is held to be responsible under the regulation as long as it is established or domiciled in Québec. The notion of establishment or domicile need to be revisited or clarified to ensure that the entity deemed responsible is connected to the sales or distribution activity. For example, if it seems appropriate to hold a sales office or distribution centre responsible, it may be questionable to target a research centre or an after sales service bureau.

➥ Verification of submitted data

Current regulations provide for part of the information declared in annual reports to be verified by a third-party expert that can attest to its veracity as the case may be. The regulation should make it clear that the expert must be independent of the activities of the entreprise. In addition to accounting information, other audits are needed to certify respect of program environmental requirements such as processing methodologies employed and program orientation criteria such as respect of 4R hierarchy.

[3] Marbek Resource Consultants Ltd, 2006. *Analyse of the problème de resquillage dans les programs de responsabilité élargie des producers*, 49 pages

6 APPENDICES AND DESIGNATION OF TARGET PRODUCTS

Designation of products targeted for recovery and reclamation under an EPR approach will form part of the appendices to the framework regulation. In addition to product definitions, these appendices will include the body of specific requirements that are applicable to programs that will be set up for those targeted products, over and above or different from general procedures established in the so-called common stem section of the framework regulation. Among these specific requirements are the following:

- Program implementation delays by category or product type
- Minimum required service levels
- Objectives and other performance indicators as well as mechanisms or methodologies used to establish quantities available for recovery or reclamation or any other mechanism allowing for periodic and subsequent targets and timetables by government decision
- Amounts to be paid in case of objectives not being met
- Specific information to be included in annual reports
- Applicable administration fees; etc.

Finally, appendices related to the management of residual hazardous materials will clarify the requirement imposed on producers to show that programs implemented according to the requirements of the regulation respect applicable standards with respect to handling, storage, transport, packaging and processing of these materials.

The following categories of materials will be designated as along with the framework regulation:

- Paint containers and residues
- Used oils including brake oils, and used oil containers, oil filters and coolants
- Certain electronic products
- Mercury lamps
- Rechargeable and non-rechargeable consumer batteries

Other product categories will be added in the future. The most likely candidates for designation within the context of an EPR approach are the following:

- Electrical appliances
- Bulky items (furniture, mattresses, etc.)
- Hazardous household waste and assimilated products such as solvents, glues, cleaning products, pressurized containers, etc.
- Pesticides
- Expired medications
- Textiles
- Tires
- Automobile components
- Asphalt shingles; etc.

7 CONCLUSION

This part of the report covers the notion of EPR as it is being considered for implementation in Québec. It presents and precisely defines the fundamental program elements and characteristics that have been selected by the MDDEP to frame its application in Québec. Moreover, it describes the advantages that flow from EPR and a variety of specific questions to be dealt with in the context of establishing framework rules. Furthermore, it presents the preferred regulatory approach used for establishing such rules, i.e., preparing a single framework regulation that includes on the one hand a so-called "common stem" that groups elements that are applicable to all concerned sectors and, on the other hand, a series of appendices that designate target products and specific procedures related to them.

Adopting a framework regulation provides many advantages including ensuring greater coherence and fairness in the application of requirements among different target sectors, encouraging alliances and partnerships as time goes by, giving advance information to producers likely to be targeted as to the conditions under which they will work and ensuring a higher degree of complementarity between individual and collective programs.

As a final note, EPR has been proven to be an economic tool that is at once strong and flexible and that tends to move environmental questions to the heart of producer concerns. It is a promising approach that guarantees success by granting producers intervention flexibility while offering them incentives to improve their upstream environmental performance right from product design, and downstream by applying performance objectives in recovery and reclamation programs for their products. In this way, EPR helps to reduce the ecological footprint products have on our environment in a sustainable development perspective, and more particularly, by incorporating the notions of product life cycles and producer and consumer accountability.

Extended Producer Responsibility (EPR)

Current status, challenges and perspectives

Part III
Paints

March 2008

Développement durable,
Environnement
et Parcs
Québec

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1 INTRODUCTION

According to available data, more than 84,000 tons of paint containers and paints were sold in Québec in 2006, of which a little more than 78,000 tons was paint. As much as 7% of all paint sold each year is discarded and becomes part of the growing household hazardous waste (HHW) generated in Québec.

Since the Regulation respecting the recovery and reclamation of discarded paint containers and paints came into effect in January 2001, Québec has a recovery and reclamation program for paint containers and residues at its disposal. This regulation was the first to be adopted in accordance with the principle of Extended Producer Responsibility (EPR), which is one of the five fundamental principles of the Québec Residual Materials Management Policy 1998-2008. This regulation obliged businesses that sell paints and paint containers within Québec to implement and fund a recovery and reclamation system that complies with established standards and objectives either individually or collectively.

Prior to the adoption of this regulation, paint residues and empty containers were in the main disposed of or recovered in a very marginal way during municipal collection of household hazardous waste or through permanent sites such as eco-centres or drop-off despots in some large cities. Opportunities for reclamation were, however, rare and not reported on. In addition, a significant proportion of recovered residue was sent for disposal at sites authorized to receive hazardous materials, or marked for incineration. It was only as of 1995, with the initiative of the *Centre de formation en entreprise et récupération (CFER)* in Victoriaville in cooperation with RONA and COOP stores and certain other producers on a voluntary basis, that paint residue collection began to grow and new recovery and reclamation opportunities arose. Through this initiative, recovered paints were processed with a view to being resold, and empty containers were sent for recycling. The regulation was constructed on the basis of this initiative so as to ensure the implementation of equitable and rigorous programs that would be accessible to the majority of Québécois.

2 THE CURRENT CONTEXT

Many Canadian provinces use Extended Producer Responsibility or similar forms of stewardship with respect to the management of paints (see Table 1). By adopting its regulation in 2000, Québec became one of the precursors in this field. In Québec, producers targeted by the EPR regulation are brandowners or first suppliers into Québec (importers, authorized agents, wholesalers, distributors and retailers).

The regulation applies to paints sold in retail or wholesale businesses in containers of less than 170 litres, intended for the maintenance, protection or decoration of buildings or adjacent structures, as well as finishings, varnishes, lacquers, wood or masonry treatments and any other preparation of a similar nature intended for maintenance, protection or decoration.

The legislative and regulatory dispositions in place result in each producer being able to choose either to implement its own recovery and reclamation program or to join an organization accredited by RECYC-QUÉBEC whose mandate provides for the implementation, management and funding of a similar program on a collective basis. Such programs must comply with various criteria such as the stipulation of territory served, type and number of collection sites, etc., and meet performance objectives.

For now, no paint producer has chosen to create an individual program. Thus, Éco-Peinture, as the only accredited organization for waste paint and pain container management, has 44 members that together, market more than 100 brands of paints in Québec. This organization works with Victoriaville-based Peintures récupérées du Québec to recover and reclaim materials subject to the regulation. Ordinary citizens and other waste producers can bring their containers and paint residues free of charge to some 1,300 collection points including 598 municipal sites and 425 retail store sites (most RONA, COOP and Bargain Building Materials locations).

During 2006, more than 2,652 tons of paints, 947 tons of containers and 15.5 tons of aerosol containers were recovered, for a total of 3,615 tons. Recovery by weight rose to 59.7% for paints, 18% for containers overall, while 3.7% of aerosol containers were recovered.

Paint residue recovery rates are based on estimated quantities that are potentially available for recovery. These quantities have been set at 7% of paints marketed in containers of less than 18.9 litres and at 2.25% for paints marketed in containers in excess of 18.9 litres. These recovery potentials are stipulated in an accreditation agreement signed between RECYC-QUÉBEC and Éco-Peinture, covering the period 2006–2010.

Table 1. Canadian programs for waste paint and container recovery

Province	Program Status	Law, regulation or policy	Target products	Target businesses and requirements	Recovery objectives	Features
New Brunswick	In development	Waste Reduction and Diversion Action Plan (2001)	Paint residues. No particular product currently specified	Regulation based on Extended Producer Responsibility	None.	None.
Saskatchewan	Operational (April 1, 2006)	*Waste Paint Management Regulations* (Nov. 2005) pursuant to the *Environmental Management and Protection Act* (2002)	Latex and oil-based paints and solvents, stains, varnishes, and all types of aerosol paints[1]	Implementation by brand owner or agreed third party. Approval required by the Minister of the Environment. Agreement signed with Product Care Report to the Minister on June 30 of each year	80% of post-consumer paints and containers[2]	Network of drop-off sites financed by an "eco-deposit" at time of purchase Taxable deposit is hidden or distinct from sales price Public awareness and publicity by Product Care 70 provincial sites[3]
Nova Scotia	Operational (June 1, 2002)	*Solid Waste Resource Management Regulations* (1996), modified in 2002 pursuant to the *Environment Act*	Oil, latex and anti-rust paints, aerosol paints (latex, alkyd and polyurethane), stains, finishes and varnishes[4]	Brand owners must register with the Resource Recovery Fund Board (RRFB) in order to sell their products in the province. Implementation of a program authorized by the Minister of the Environment, brandowner or agreement with the	No specific objective or regulation	Program administered by the RRFB 84 HHW DEPOTS No visible cost charged to the system Province-wide publicity (RRFB Website, circulars and publicity) (2006 results: +11.5%)

[1] Same list as in British Columbia and Nova Scotia
[2] Product Care program objectives.
[3] SARCAN container deposits.
[4] Same list as in Saskatchewan and British Columbia

Province	Program Status	Law, regulation or policy	Target products	Target businesses and requirements	Recovery objectives	Features
				RRFB Retailers are responsible for ensuring that brandowners are registered.		
British Columbia	Operational (1994)	*Post-Consumer Paint Stewardship Program Regulation* (1994), modified on June 26, 1997 and replaced by the *Recycling Regulation* (2004), pursuant to the *Waste Management Act*	Group 1: Paints intended for consumers, varnishes, residential and consumer stains. Empty containers Group 2: Paints used for marking trees and specialized aerosol industrial paints	Program prepared by brand owners or third parties subject to agreement Program implemented by Product Care on behalf of 60 members that sell Group 1 paints (104 depots). Program implemented by Tree Marking Paint Stewardship Ass. (TMPSA) on behalf of the three 3 Group 2 members (27 depots) Annual report submitted to the Minister	80% of paints and containers[5] 80% of aerosols, short-term[6] Results (2004): 50% of containers (TMPSA)	Public awareness by accredited organizations Ecodeposit at time of purchase: $0.10 <250 ml; $0.25 from 250 ml to 1l; $0.40 from 1.01 l to 5 l; $1.00 from 5.01 l to 23 l; $ 0.10 $ for aerosols. No ecodeposit required of forest businesses that process containers on site No more than 10 containers or 50 aerosols per visit to depot Urban collection sites at no more than 4 km; rural sites at no more than 10 km Municipalities can act as collection sites
Alberta	In effect: April 1, 2008	*Paint and Paint Container Designation Regulation* pursuant to the *Environmental Protection and*	Architectural latex and oil-based paints, solvents, varnishes, lacquers, stains Aerosol containers (all formats); Empty paint containers; Limited to paints sold in containers of	Program managed by The Alberta Recycling Management Authority (Alberta Recycling) Program not based on Extended Producer Responsibility	No specific objective of the regulations	Municipalities act as main collection sites. Ecodeposit at time of purchase for containers of 23 l or less[7] to finance awareness campaign and program implementation as well as recycling costs.

[5] Product Care program objective.
[6] TMPSA program objective.
[7] Costs will be the same as in British Columbia and Saskatchewan.

Province	Program Status	Law, regulation or policy	Target products	Target businesses and requirements	Recovery objectives	Features
		Enhancement Act	23 L and less			
Ontario	Designation in 2006 Program subject to a consultation	*Municipal Hazardous or Special Waste Program Plan (MHSW)* pursuant to the *Waste Diversion Act (WDA)* (2002)	*Municipal Hazardous or Special Waste* WDO (Waste Diversion Ontario) program targeting the following products: Latex and oil-based paints for architectural coating including paints sold for residential purposes and products sold by small businesses (e.g., stains in containers of 30 litres and less). All residential and industrial aerosol paints Highway signage paints excluded.	Materials targeted by the program and managed by Stewardship Ontario, which has WDO-designated responsibility for implementation of the MHSW program. Collection sites in municipal depots	No specific objectives included in either the program or regulation 47% of paint residues currently recovered (except for containers): percentage subject to verification	Recoverable potential estimated at 10% of paints sold Targeted containers must have paint residues, approximately 20% of sales Costs of about $0,073 per kg of paints sold or $0.36 per 3.78 l. Current depots: 92 municipalities, City of Ottawa take-back programs and numerous merchants on a voluntary basis.

3 PROPOSED CHANGES

In order to extend the range of the new dispositions provided for in the framework regulation to all target sectors and ensure greater coherence in the application of EPR in Québec, it is proposed to move the essentials of the Regulation respecting the recovery and reclamation of discarded paint containers and paints to an appendix.

The Ministère du Développement durable, de l'Environnement et des Parcs (MDDEP) wants to take advantage of this recasting to make some changes to the regulation and clarify some parts of it or resolve application issues. Most of the changes aim at responding to situations or difficulties brought up by Éco-Peinture.

While some of the changes may be applicable as soon as the regulation comes into force, a transitional period is foreseen for the application of most of the new dispositions. This period will be determined by taking into account the 2010 expiry date and dispositions of the accreditation agreement between Éco-Peinture and RECYC-QUÉBEC.

Certain problems in the application of the Regulation respecting the recovery and reclamation of discarded paint containers and paints are of a nature that goes beyond the category of containers and paint residues. They are dealt with in the "common stem" section of the draft framework regulation orientation document and as such will not be extensively discussed here. We can however say that these problems concern in particular the necessity of clarifying notions such as "free access for citizens," "first supplier" or "place of business in Québec" and of taking account of reuse in the calculation of the achievement of objectives.

Changes specific to the category of containers and paint residues:

➥ Definition of target paints

The current regulation covers all paints in retail outlets except for paints intended for artists, and paints sold in the wholesale trade intended for the maintenance, protection or decoration of buildings and adjacent structures sold in containers of less than 170 litres. However, the regulation gives no particular definition of applicable paints sold at retail, other than that these include stains, finishes, varnishes, lacquers, wood or masonry treatment products as well as any similar preparation intended for maintenance, protection or decoration. In addition, the limit on container volume does not apply to products sold in retail outlets. Finally, notions of retail and wholesale businesses may be subject to overlap, especially in the case of retailers that also serve contractors, and big-box warehouse stores.

Currently, products accepted by Éco-Peinture include finishes and latex, alkyd, enamel or other paints, metal and anti-rust paints, aluminum paints, stains, varnishes and lacquers, aerosol paints, wood or masonry preservatives sold in the retail or wholesale trade and signage paints sold in retail outlets.

The paint industry would like the regulation to refer to the notion of architectural paint commonly used in this sector. According to the Canadian Paint and Coatings Association, an architectural coating is one recommended by its manufacturer to be applied to fixed surfaces of structures, movable buildings, roads or sidewalks for purposes of protection, decoration or any other function. There are many categories of architectural coatings including interior and exterior paints, highway marking and signage paint and industrial maintenance coatings.

Architectural coatings however, do not include glues, coatings recommended by manufacturers or importers solely for factory applications or in the context of a workshop manufacturing process, or coating recommended solely for non stationary or mobile structures such as aircraft, ships and railway cars.

There is thus a need to revisit the sections of the regulation that concern the definitions of applications in order to clarify product types and reduce the risk of confusion in interpretation. If the notion of architectural paint makes it possible to comprehend the various kinds of paints and their utilisation, it remains preferable to propose a definition within the terms of the regulation itself. This will allow for precisely defining what "industrial maintenance coatings" means as opposed to "coverings intended to be applied in factories," and whether certain low-residue paints such as signage paints are to be included. However, the revision should not exclude currently included product types and include all types of paints that have been returned to program collection sites since 2001, even if some of these had to be sent to secure disposal facilities. It is thus proposed to produce a general definition of targeted paints that includes both technical and intended usage characteristics and to attach a detailed non-exhaustive list of the principal types of included paints.

Finally, it is also proposed to abandon the notion of retail and wholesale trade in favour of container volume with respect to paint sales. This step will also include a decision on whether to exclude very small (<100 ml) format containers including samples and formats in excess of 30 or 50 litres such as in the oil paint sector.

➥ Territorial limitation on the application of the regulation

The current regulation creates recovery obligations on the territory of Québec south of the 51st parallel only and as such, is unfair to the populations of certain northern or outlying areas that should have the benefit of minimum services. Conditions pertaining to applicable levels of service for outlying or isolated areas may be different than those set for the southern part of Québec and rely, for example, on the establishment of agreements with the representatives of such regions that aim to define recovery methods commensurate with these environments.

➥ Service levels

While allowing some flexibility to producers, dispositions targeting a minimum level of service that make it possible to respond to overall consumer needs must be maintained for all the southern regions of Québec. However, the dispositions must take account of the fact that it is impossible to require greater access to recovery services than to sales outlets.

Moreover, while service levels should correspond to the nature of designated products as well as the rhythm and practices of their use, care must be taken to ensure that the levels of service provided for in the various appendices trend towards a certain similarity in order to facilitate cooperation and partnerships and to ensure that the principal clientele is reasonably served on the whole. It is thus envisaged to revisit the established criteria through which required levels of service are set, without however engendering a drop in current service levels. In addition, following practice in other designated sectors, the calculation of the number of collection sites that is currently based on the number of local municipalities could instead be based on the number of regional municipalities, which are the territorial units used in planning the management of residual materials in Québec.

➥ Recovery objectives

Paints are products with a short life cycle and of which significant parts disappear with usage. Their potentially recoverable ratios are difficult to gauge, especially since they are sometimes subject to medium-term and long-term conservation by consumers. When the regulation was adopted in 2000, there was neither sufficiently documented information nor proven methodology concerning the calculation of paint residue quantities available for recovery. The recovery objectives of the current regulation are thus based on the number of containers, which in 2008, meant recovering 75% of all containers sold. To that must be added the requirement of recovering and reclaiming all paint residues present in returned containers. There is no specific objective for paint residues as such. Moreover, the accreditation agreements between the Minister and Éco-Peinture and, since 2002, between RECYC-QUÉBEC and Éco-Peinture, have established a rate of potentially available paint for recovery based on quantities sold (see section 2 of this document). However, the validity of the methodology used has not been demonstrated nor has proof been given that it takes account of the Québec context.

It would be advisable to define the objectives with respect to paint residues within the appendix to the regulation in order that they apply to all programs whether individual or collective in nature. Given that even today, documentation is weak or inexistent concerning the methodology and data used to establish amounts of residual paint available for recovery, the appendix should provide a mechanism for setting these that could evolve over time and stemming from which targets set by the regulation could be applied. This methodology will need to take account of the nature of various types of applicable paints sold, various types of clientele (i.e., commercial versus residential) and Quebecers' consumption and conservation habits.

The recovery of paint containers poses some problems for the industry, in part because consumers tend to return only containers that actually contain paint residues. Efforts at making consumers more aware and adapting collection sites may be necessary to correct this situation. The paint industry feels that empty containers should be recovered by municipal blue-box type collection services. However, these containers are not generally accepted in blue-box services due to the risk of contamination by paint residues. In addition, no municipal service serves the businesses that generate significant quantities of residues. Producers must remain responsible for recovery, but may, should they so desire, work to establish partnerships with municipal authorities with respect to the recovery of a portion of the containers.

As the current 2008 regulation and agreement objectives (75% of containers sold and 75% of paint considered to be available for recovery) corresponds to the 2008 objectives by sector as indicated in the Québec Residual Materials Management Policy 1998-2008, they should be presented as is in the appendix. Since aerosol containers are recovered and processed separately from other containers, this distinction should not cause any major problems in the management of recovery and reclamation programs.

➥ Annual Reports

As indicated in the framework regulation common stem document, performance incentives applicable to cases where individual program objectives are not achieved, and administrative fees required for case examination will be stipulated in the appendix.

In addition, annual quantities of designated products sold will need to be indicated in the annual report.

4 CONCLUSION

Experience gained through the application of the Regulation respecting the recovery and reclamation of discarded paint containers and paints since it came into effect in January 2001 has made it possible to determine many factors that will be included in the common stem that establishes the overall framework for broadening Extended Producer Responsibility to a wider product range. Therefore, it seems appropriate to transfer the current paint regulation under the framework regulation where current and modified obligations will be covered either in the common stem or in the specific appendix.

This transfer provides an opportunity for making changes and fine-tuning the methods applicable to the paint container and residue sector so as to allow for a more harmonious regulatory application.

Extended Producer Responsibility (EPR)

Current situation, challenges and perspectives

Part IV
Oils and coolants

March 2008

Développement durable,
Environnement
et Parcs
Québec

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1 INTRODUCTION

Used oils, oil containers and oil filters make up a significant proportion of hazardous waste generated in Québec. According to 2006 figures, nearly 120 million litres of oil requiring the use of 2.7 million kilograms of containers and more than 6.5 million oil filters were sold in Québec.

Oil residues are hazardous materials. When they are inadequately managed, for example when they are poured down drains, buried in landfills or incinerated at unauthorized or non-compliant facilities, these residues can cause significant contamination of waterways, soils and water tables and engender non-negligible atmospheric pollution. These residues are covered in the Québec Residual Materials Management Policy 1998-2008 that stipulates that they should be managed under an Extended Producer Responsibility, or EPR, approach that guarantees implementation of recovery and reclamation programs.

The Regulation respecting the recovery and reclamation of used oils, oil or fluid containers and used filters came into effect in October 2004. If a significant proportion of used oils generated in Québec, in particular oils generated by automobile repair shops, was already handled by various recovery means, it was previously difficult to know what quantities were effectively recovered and reclaimed and what was their final destination. In addition, since recovery services had to be paid for, unknown quantities were simply disposed of on parallel markets. This EPR regulation allowed for circumventing recovery and reclamation of used oils while including oil containers and filters.

2 CURRENT CONTEXT

The EPR or other stewardship approaches to the management of used oils are fairly widespread in regulations adopted by Canadian provinces (see Table 1). Québec regulations follow this major trend. In Québec, producers targeted by the EPR approach are either brandowners with a place a business in Québec or first suppliers of these products to the Québec market (importers, authorized suppliers, wholesalers, distributors or even retailers).

Target products are mineral, synthetic or vegetable oils intended for lubrication, insulation or heat transfer in motor vehicles or equipment or for hydraulic systems or transmission containers including aerosol containers with a capacity not in excess of 50 litres, oil filters used for internal combustion engines, hydraulic systems and transmissions, coolant filters and filters used in fuel oil heating systems or oil storage tanks and diesel filters.

Table 1. Canadian oil, filter and container recovery programs

Province	Provincial law or regulation	Target products	Target businesses and requirements	Recovery objectives	Program features
Alberta	*Lubricating Oil Material Recycling and Management Regulation Act (AR 82/97)* *Lubricating Oil Material Recycling and Management By-law* *Material Environmental Handling By-law Regulation*	Lubricating mineral or synthetic oils used for insulation, lubrication, hydraulics or heat transfer All types of oil filters except gasoline filters Containers not in excess of 30 litres[1]	Any enterprise that markets target products under a brand name that it owns or uses is required to join the Alberta Used Oil Management Association (AUOMA) before receiving authorization to sell the target products Voluntary collection sites: no financial incentives	No regulatory objectives Objectives are defined in each three-year plan Recover objectives for 80% of target products set by AUOMA Results (2004): Recovery rate for oils of 77%, 84% for filters and 50% for containers	Environmental handling fees set for initial vendors of oils and filters[2] Fees may be printed on sales slips For 2004: 753 collection sites (municipal, service stations, recycling facilities) and 53 ecocentres Free AUMOA telephone service
Saskatchewan	*Used Oil Collection Regulations (1996)* *Environmental Management and Protection Act (2002)* and the *Hazardous Substance and Dangerous Goods Regulations (1989)*	Lubricating mineral or synthetic oils used for insulation, lubrication, hydraulics or heat transfer All types of oil filters except gasoline filters Containers not in excess of 30 litres[3]	Producers & manufacturers of target products and enterprises that import for their own use Individual or collective programs allowed Mandatory membership in the Saskatchewan Association for Resource Recovery Corporation (SAARC)	No regulatory objectives Results (2001): Recovery rate for oils of 75% and 79% for filters Results not available for containers	Environmental handling fees[4] Fees may be printed on sales slips 35 ecocentre collection sites No cross subsidization between target products SAARC handles awareness campaigns

[1] Containers of 60 and 205 litres are subject to deposit.
[2] Fees (same as in Saskatchewan): less than 50 litres: $.05/litre of oil, $.05 $/litre for containers, and $.50 per filter not in excess of 8 inches and $1.00 per filter in excess of 8 inches.
[3] Containers of 60 and 205 litres are subject to deposit.

Province	Provincial law or regulation	Target products	Target businesses and requirements	Recovery objectives	Program features
Manitoba	Waste Reduction and Prevention Act (1990) Used Oil, Oil Filters and Containers Stewardship Regulation (1997)	Crankcase oil, motor oil, hydraulic fluids and coolants, transmission, clutch and gearbox oils, as well as any fluid that may be used for lubricating machines All types of oil and diesel filters except for gasoline filters[4]	First suppliers of target products Importers and enterprises for their own use Individual or collective programs Manitoba Association for Resource Recovery Corporation (MARRC) recognized for collective program management by the Minister Mandatory membership in MARRC Required annual report	No regulatory objectives Recovery objective of 80% set by the provincial Association <u>Results (2004)</u>: Recovery rate for oils of 76% and 76% for filters Results not available for containers	*Environmental Handling Charges collected at point of sale* (EHC)[5] 44 municipal collection sites EHC individually collected on target products No cross-subsidization between target products SAARC handles awareness campaigns
British Columbia	*Return of Used Lubricating Oil Regulation (1992)* *Recycling Regulation (2004)* under the *Environmental Management Act (EMA)* *Post-Consumer Residual Stewardship Program Regulation (2004)*	Lubricants: motor, transmission and crankcase oils All oil filters except gasoline filters Oil containers not in excess of 30 litres	Brandowners submit individual or collective procedural and funding management plans for ministerial approval Plan approval required to sell target products Retailer collection or within 4 km radius unless exempted British Columbia Used Oil Management Association (BCUOMA) program approved	No regulatory objectives <u>Results:</u> Not available	Mandatory signage including approved industry used oil recycling logo, information on oil collection service available on site or name and location of collection site mandated to accept vendor's used oils and amount of Environmental Handling Charge paid by consumers to finance the program. 540 collection sites

[4] Fee schedule: $.05/litre of oil, $.05 $/litre for containers, and $.50 per filter not in excess of 8 inches and $1.00 per filter in excess of 8 inches

[5] Fees (same as in Saskatchewan): less than 50 litres: $.05/litre of oil, $.05 $/litre for containers, and $.50 per filter not in excess of 8 inches and $1.00 per filter in excess of 8 inches.

Province	Provincial law or regulation	Target products	Target businesses and requirements	Recovery objectives	Program features
Prince Edward Island	Regulation EC425/92 (*Used Oil Handling Regulations)* pursuant to the *Environmental Protection Act*	All lubricating oils including motor, transmission and crankcase oils Filters and containers not covered	Vendors required to set up return facilities or contract for similar services with a facility within 10 km On-site used oil return or information on closest available site Annual recovered volume declared to Minister No collection fees	No regulatory objectives Results not available	Maximum of 10 litres per day per consumer or the volume of the largest container on sale
New Brunswick	Used Oil Regulation 2002-19 under the Clean Environment Act	All lubricating oils including motor, transmission and crankcase oils Filters and containers not covered	Vendors required to set up return facilities or contract for similar services with a facility within 10 km On-site used oil return or information on closest available site Biannual reports of quantities recovered Incineration of recovered oil allowed Program self-financed through sales of used oils	No regulatory objectives Results not available	Display information supplied by the Ministry Distribution of consumer brochures supplied to vendors by the Ministry Coordination by the Ministry Maximum of 25 litres per day per consumer
Nova Scotia	*Used Oil Regulations* (1995) modified in 1996 pursuant to the *Environmental Protection Act* *Guidelines for the storage of used oil*	Lubricating oils. Petroleum or synthetic products as follows: lubricating oils, hydraulic fluids, fluids for metalworking and insulation Filters and containers not targeted	Vendors (wholesalers, distributors) of new oil to set up return facilities on site or contract for similar services with a facility within 5 km. Manufacturers subject if considered as wholesalers or distributors Wholesalers and	No regulatory objectives <u>Results (2006)</u>: 70% of sales	Window-displayed information poster provided by the Ministry Maximum of 10 litres per day per consumer or the volume of the largest container on sale Charges allowed if the programme does not self-finance through sales of

Province	Provincial law or regulation	Target products	Target businesses and requirements	Recovery objectives	Program features
			distributors prohibited from selling oils to merchants with no recovery facilities Vendors required to provide inform on oil depot sites when no service available on site Annual report on quantities recovered and/or incinerated Program managed by the Resource Recovery Fund Board (RRFB)		used oils
Ontario (2006 designation)	*Municipal Hazardous or Special Waste Program Plan (MHSW)* pursuant to the *Waste Diversion Act (WDA)* (2002) *Used Material Regulation* (2003) pursuant to the *WDA*	Oil filters and containers not in excess of 30 litres, coolants, antifreeze and containers not in excess of 30 litres targeted by MHSW: residential and small business materials targeted Used oils covered by the *Used Oil Material Regulation*	MHSW program managed by Stewardship Ontario, responsible organization designated by WDO Subject to public hearings Municipal collection sites or through the "Blue Box Program" WDO accreditation as an organization representing the oil industry for the purposes of establishing a program through Ontario Used Oil Management Association (OUOMA)[6]	No regulatory objectives Results: implementation projected during 2008	Container fees: $.85 / kg; $.045 per litre or $.17 per unit of 3.78 litres Filter fees: $.825 / kg; $.499 per filter not in excess of 8 inches in diameter and $.998 per filter 8 inches in diameter or greater Antifreeze and container fees not available

[6] Program submitted by OUOMA in 2004 was not authorized by WDO, which sent its recommendations to the Minister who has not yet ruled.

Province	Provincial law or regulation	Target products	Target businesses and requirements	Recovery objectives	Program features
Newfoundland and Labrador	*Used Oil Control Regulations* under the *Environmental Protection Act*	Lubricating oils, crankcase and transmission oils, greases Filters and containers not targeted	Vendors required to set up return facilities or contract for similar services with a facility within 5 km Mandatory inspection of used oils for contaminants. Individual product management authorization required[7] Multi-material Stewardship Board (MMSB) is responsible for program management	No regulatory objectives Results not available	No program fees Program information must be displayed at point of sale Declaration of quantities of used oils collected On-demand reporting requirement

[7] Authorizations from Department of Environment and Conservation

The legislative and regulatory dispositions in force mean that any producer may choose between implementing its own recovery and reclamation program or becoming a member of an organization accredited by RECYC-QUÉBEC whose mandate is the implementation, management and funding of a similar, collective program. Such programs must meet a number of criteria (area served, type and number of collection sites, etc.) and performance objectives.

Since the regulation came into effect, four brandowners have chosen to implement individual systems: Canadian Tire (Québec), Safety-Kleen, Lubrifiants Saint-Laurent (Pétroles Crevier) and Lubrifiants PFL (Paquet et Fils ltée). More than 200 other Québec brandowners or first suppliers have joined the Société de gestion des huiles usagées (SOGHU), which is the only organization currently accredited to manage used oils, oil containers and used filters.

Of the above-mentioned four companies, two are in the retail trade and have made collection sites available to the general public. The others sell to a private commercial and industrial clientele and provide customers with a pick-up recovery service. As for the SOGHU, it has implemented a subsidy system for recovery and reclamation operators under a set of compliance criteria and other contractual conditions, as well as a network of collection sites that include municipal depots and specialized retail outlets.

The regulation sets 2005 recovery goals of 50% for oil containers and filters and 70% for oils. Objectives for all three categories will rise to 75% as of 2008.

Cumulative across-the-board Québec figures for 2006 show that a recovery rate of 88% was attained for used oils and 74% for filters (see Table 2). The SOGHU also registered a 55% recovery rate for containers (including aerosols) for the same year.[8]

[8] Figures for 2006 covering containers in the four individual programs are not yet available. In 2005, the recovery rate was 33% on total sales of 4.9 million containers including aerosols. Recovery rates for 2006 are expected to rise above that number.

Table 2. 2006 recovery program results

Year 2006	Cumulative results			
	Quantities sold	**Recovery potential***	**Actual recovery**	**Recovery rate**
4 INDIVIDUAL PROGRAMS				
Oils (litres)	7,952,540	5,328,202	4,189,401	79%
Containers (capacity in litres)	N.A.	N.A.	N.A.	N.A.
Containers (kg)	N.A.	N.A.	N.A.	N.A.
Aerosol containers (kg)	C	C	C	11%
Filters (units)	C	C	C	80%
Filters (kg)	C	C	C	80%
SOGHU				
Oils (litres)	110,910,112	74,309,775	66,121,920	89%
Containers (capacity in litres)	44,741,204	44,741,204	24,518,179	55%
Containers (kg)	2,352,559	2,352,559	1,288,267	55%
Aerosol containers (kg)	123,776	123,776	5,694	4,6%
Filters (units)	9,491,595	9,491,595	7,023,780	74%
Filters (kg)	6,292,927	6,292,927	4,654,190	74%
QUÉBEC OVERALL				
Oils (litres)	118,862,652	7,963,798	70,311,321	88%
Aerosol containers (kg)	C	C	C	4.6%
Filters (units)	C	C	C	74%
Filters (kg)	C	C	C	74%

C: Only one company sells filters, and aerosols containers under its own brand; therefore specific data is not made public for confidentiality reasons.

* Considering that 67% of oils sold are potentially available for recovery

3 PROPOSED CHANGES

In order to extend the reach of new dispositions in the framework regulation across-the-board to targeted sectors and thus ensure a higher level of coherence in EPR application within Québec, it is necessary to transfer the essentials of the regulation on recovery and reclamation of used oils, oil and fluids containers and used filters to an appendix.

The Ministère du Développement durable, de l'Environnement et des Parcs (MDDEP) wishes to use this opportunity to bring some changes to the regulation and clarify certain of its elements or resolve certain problems related to its application. Most of the proposed

changes relate to situations or difficulties that emerged during follow-up of individual or SOGHU program reports.

While some changes could be applied as soon as the regulation comes into force, a transitional period is envisaged for most of the new dispositions and will be determined by taking into account deadlines and dispositions of the accreditation agreement between SOGHU and RECYC-QUÉBEC.

Certain application problems with the Regulation respecting the recovery and reclamation of used oils, oil or fluid containers and used filters also apply to broader issues. They will not be presented in detail in this document as they are already covered in the "common stem" section of the orientation document on the draft framework regulation. However, it should be noted that in particular, these issues affect the need to clarify notions such as "free citizen access," "first supplier" and "establishment in Québec" as well as a number of follow-up and performance requirements.

Changes that are specific to the category of used oils, oil or fluid containers and used filters concern the following:

➥ Clarifications as to field of application and addition of like products

Section 2 of the current regulation presents a global definition of targeted oils that is completed by Appendix I, which offers a non-exhaustive list of various types of oils that are included. Furthermore, Section 3 of the regulation defines target containers by the types of oil for which they are used, as listed in Appendix II, targeted in Section 2 or gas compressor oils. This manner of proceeding leads to diverse interpretations and to a high level of confusion. For example, while Section 2 does not necessarily exclude two-stroke motor oils that are consumed during use, the reference to this type of oil in Paragraph 1 of Section 3 distinctly includes oils covered by Section 2 while Paragraph 2 of Section 3 seems to exclude them. While such exclusion may be appropriate, it is important to establish this more clearly, if only to define the quantities of used oils available for recovery compared to target oils actually sold. Moreover, the appendix lists need to be as complete as possible since, while they are to be non-exhaustive, they are generally interpreted as representing the field of application.

There is also a need to revisit or clarify certain terms employed in appendices I and II, such as the distinction between a "domestic" and a "commercial" marine engine.

➥ Addition of new products

Some residual materials come essentially from the same generators as used oils. In that sense, we need to consider addind them to the used oil-related product sector list

designated in the appendix to the framework regulation.[9] This will allow for greater recovery of materials that are harmful to the environment, while letting producers choose a recovery system that has already been implemented by principal generators (the piggy-back approach). This change especially concerns engine coolants. In addition, brake fluids, which were not clearly mentioned in the application of the regulation in force with respect to used oils, will be added and be considered in the same manner as other oils or fluids in the appendix and included in the calculation of quantities available for recovery and reclamation objectives. However, certain coolant-specific characteristics such as the fact that they are sometimes marketed in concentrated form, makes it difficult to establish the quantities available for recovery that need to be taken into account when establishing objectives and performance indicators.

➥ Objectives

Objectives applicable to containers and filters as established in the regulation currently in force (Sections 6 and 7) are based on quantities of containers or filters sold annually. This methodology presents no problems as the situation it relates to is a simple one covering two types of so-called short life products that are discarded whole and offer no possibilities for reuse. With respect to these kinds of products, objectives established as a function of a proportion of quantities sold (by weight or equivalent litre volume) remain desirable. It should be noted however that the disposition stipulating that recovered filters must be drained of all free-flowing oils or other fluids also needs to apply to recovered containers. Furthermore, while not being the subject of a distinct objective, quantities recovered from aerosol containers should be calculated separately. This is unlikely to pose any particular problems since unlike other oil containers, aerosol containers are usually made of metal, formats are indicated in grams and they are potentially explosive. They are thus not easily assimilated with other containers.

[9] They may also be included in a separate appendix if it is demonstrated that this step would facilitate the implementation of recovery and recycling programs.

The current regulation also stipulates that oil recovery objectives are calculated based on annual sales of oils (Section 5). However, since part of these products is likely to disappear with use, objectives in this case need to be set using a reliable methodology if we are to avoid making them too stringent or inoperable. Right now, according to the dispositions of the accreditation agreement between RECYC-QUÉBEC and SOGHU, calculations regarding meeting SOGHU used oil recovery objectives are based on a value of 67% of sales. Moreover, since it has been unable to require benchmark data enabling it to calculate this value for the four companies that have implemented individual programs, or make any required adjustments with respect to specific situations, the MDDEP has chosen to apply the same percentage in this case.

However, this situation needs to be corrected. On the one hand, the regulation should be changed to make it operant and, on the other hand, quantities of used oils that may be potentially available for recovery should be calculated separately for each program, taking into account types of oils sold by target producers. In point of fact, quantities lost through use may vary by type of oil, principal usage, product evolution and clientele. If the information used to evaluate the quantities of used oils that are available for recovery comes from external studies, it needs to be adapted to the Québec context.

It is consequently necessary to include, in the appendix to the regulation, a template mechanism or methodology for establishing quantities available for recovery (including brake fluids) to which regulatory targets would apply. Regarding coolants, a distinct mechanism or methodology should be established. Recovery objectives specific to these liquids will be defined in the appendix.[10]

There is also a need to require studies or sampling to establish the proportion of containers not designated by the regulation that are recovered at the same time as targeted containers.

➥ Area served and minimum service levels

The current regulation sets recovery requirements only for regional municipal counties (RMC) including the two large metropolitan communities and Lévis and Gatineau as well as for all cities with more than 25,000 inhabitants whose territory is not part of an RMC. Furthermore, the number of collection sites is determined either according to number of points of sale or according to RMC population figures. Large and poorly populated areas and certain northerly or outlying areas are not within the purview of this requirement that makes the regulation unfair and deprives their populations of minimum recovery services.

On the one hand, one can see that conditions relating to service levels applicable to outlying or isolated areas may be different from those set for southern Québec and rely, for example, on signing agreements with representatives from these areas in order to set recovery procedures that are adapted to these environments. On the other hand, while providing some flexibility to producers, there is still a need to maintain dispositions

[10] This appendix could be separate from the one covering oils.

relative to minimum service levels for all regions in the south of Québec that respond to the needs of generators as a whole. However, these dispositions must take account of the fact that it is impossible to require greater access to recovery services than to sales outlets.

Additionally, while service levels must correspond to the nature and user consumption patterns of designated products, there will be a need to ensure that the service levels as established in the various appendices trend towards a certain degree of similarity in order to facilitate cooperation and partnering, and also to ensure that the principal clientele receives reasonable service overall. To this end, it is likely that established criteria will be revisited so as to set required service levels without, however, inducing lower than current levels.

➥ Information transmission and annual reports

The current regulation requires that information transmitted with respect to the transport, warehousing and processing of recovered products and quantities recovered, reclaimed or disposed of take into account the various types of oils sold (Section. 12, paragraph 4 and Section 13, paragraph 1). The requirement of distinguishing between oil types at the post-consumption stage should be abandoned since used oils are recovered in bulk and it is not possible to make such distinctions.

As far as recovered containers go, the requirement that quantities of recovered containers are to be indicated “by weight and number of units” (Section 13, paragraph 1) should be changed to “by weight and volume in equivalent litres.”

In order for fair and ongoing evaluation of program performance, there is a need to ensure (as indicated in the orientation document relating to the framework regulation) that EPR program annual reports detail quantities of designated products sold during the year and not only for those years where objectives have to be met. Additionally, the requirement that information be made available at the convenience of the Minister (Section 13, paragraph 2) should be changed to clearly indicate that this information is required to be transmitted annually.

Furthermore, the annual report needs to clearly explain the method used to calculate recovered quantities of containers and filters, and in particular, the techniques used to drain containers and filters, so as to avoid cross-overlapping of declared recovered quantities from one product to another.

Finally, the regulatory appendix needs to clarify performance incentives applicable to individual program as well as administration fees required for case evaluation.

4 CONCLUSION

Experience acquired in the application of the Regulation on recovery and reclamation of used oils, oil and fluid containers and used filters since it came into force in October, 2004 has led to the identification of a number of factors that will become part of a common stem that establishes an overall framework for applying EPR to a wider range of products. Consequently, it is necessary to incorporate this regulation into the framework regulation and its appendices.

This transfer provides an opportunity to make changes to specific procedures that apply to the used oil, oil container and oil filter sector with a view to a more equitable and harmonious application of the regulation to all stakeholders. This will also be the appropriate time to widen the reach of the regulation to include new materials generated by usage in like places and, in particular, to brake fluids and coolants.

Extended producer responsibility (EPR)

Current status, challenges and perspectives

Part V
Electronic products

March 2008

Développement durable,
Environnement
et Parcs
Québec

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INTRODUCTION

The volume of electronic products that have reached their end of useful life has risen rapidly in recent years, in particular due to increased use, shorter product life and lower cost to consumers. This situation has resulted in a concomitant rise in the volume of electronic products sent to disposal. In addition to creating more and more of an encumbrance to landfill sites, the hazardous nature of many of their component substances constitutes a threat to the quality of the environment. What's more, the high value and scarcity of many of their components and the environmental costs associated with their disposal means that this solution is far from being an optimal utilisation of resources.

In this context, Québec has chosen to proceed with an Extended Producer Responsibility (EPR) approach in the field of electronic products, pursuant to one of the fundamental principles of the Québec Residual Materials Management Policy 1998-2008 (The Policy). It also extends the actions of The Policy with respect to recovery of hazardous household waste that prescribes adopting regulations requiring enterprises that manufacture and sell hazardous products to recover and process them. The proposed regulatory approach seeks to produce an appendix to the draft EPR framework regulation. This part of the report looks solely at the particular characteristics of electronic products in an EPR perspective, describes current sales of electronic products and their end of useful life management, lists products that should be designated, considers objectives to be set, means of collection and implementation delays. In addition, the report offers an estimate of quantities that could be recovered through the implementation of recovery and reclamation programs.

1 SALES OF ELECTRONIC PRODUCTS IN QUÉBEC

Global sales of computers and peripherals have grown by 10% annually since the 1980s. By 2002, more than one billion computers had been sold with 130 million new units added to that figure each year.[1] Table 1 shows figures confirming significant information and communications technology (IT) sales in the Québec market. These figures come from estimated data concerning Canadian sales of certain IT products, prorated to the population of Québec.

Insofar as television sets, which are not covered in Table 1, are concerned, 518,000 of these devices were sold in Québec in 2005.[2] Mobile telephones have seen an exponential rise in use since they were introduced in the 1970s and by 2004 there were 1.758 billion[3] users worldwide. Within Canada, 66.8% of households own one or more mobile phones[4]

[1] RECYC-QUÉBEC (2006), Fact sheet, *Les technologies de l'information et de la communication* (http://www.recyc.gouv.qc.ca)
[2] Resource Recovery Fund Board (2006), *Electronic Waste Recovery Study*
[3] Secretariat of the Basel Convention (2006), *Guidance document on the environmentally sound management of used and end-of-life mobile phones* (http://www.basel.int/meetings/frsetmain.php)
[4] Statistics Canada (2006), *Residential Telephone Service Survey*

with close to 39% of households owning two or more[5]. The number of mobile telecommunication subscribers in Canada surged past 15 million in 2005[6] and the cellular telephone is currently the only means of household communication for 5% of Canadians.[5] In Québec, more than 600,000 units were sold in the year 2004 alone.[7]

TABLE 1. Unit IT sales in Québec (2002 and 2004)

Products	Actual 2002 unit sales	Estimated 2004 unit sales
Desktop computers and servers	531,760	524,400
Laptop computers	147,430	160,540
Total (computers)	**679,190**	**684,940**
Cathode ray tube (CRT) monitors	519,800	348,910
Flat screen (LCD) monitors	91,770	283,360
Total (screens)	**611,570**	**632,270**
Scanners	116,610	88,090
Printers	521,180	549,930
Total (scanners & printers)	**637,790**	**638,020**
Mobile phones	649,060	624,450
Telephone handsets	708,630	737,150
Total (telephones)	**1,357,690**	**1,361,600**
Photocopiers	88,550	86,940
Total TIC	**3,374,790**	**3,403,770**

Source: Ris International Ltd, *Information Technology (IT) and Telecommunication Waste in Canada – 2003 update*, RECYC-QUÉBEC (2006), in *Les technologies de l'information et de la communication* (http://www.recyc.gouv.qc.ca)

There have been constant and fast-moving changes to the popularity of various electronic products. For example, Table 1 shows this phenomenon as it concerns computer monitors, where sales of cathode ray tube monitors have plunged compared to sales of flat screen monitors.

2 ENVIRONMENTAL ISSUES RELATED TO ELECTRONIC PRODUCTS AT THEIR END OF USEFUL LIFE

2.1 Products that litter landfill sites

In the United States, electronic waste accounts for from 1% to 3% of municipal residual materials and this figure is rising quickly. During the next 20 years, the average American household will discard 68 electronic products including 10 computers, 20

[5] Rechargeable Battery Recycling Corporation (2006), *Recycle your rechargeable batteries and cell phones* http://www.rbrc.org/call2recycle/consumer/index.html
[6] Statistics Canada (2005), *Telecommunications statistics*
[7] RECYC-QUÉBEC (2006), *Les technologies de l'information et de la communication* http://www.recyc.gouv.qc.ca

mobile phones, 7 television sets and numerous videotape, CD and DVD players, telephone answering machines and printers[8].

In Canada, more than 99,000 tons of residual IT materials were generated in 2005. This stems notably from their short average life of 3.5 years: the product that has the shortest average life – 2 years – is the mobile phone.[9]

In Québec, residual material tonnage estimates have been made for desktop computers, servers, laptop computers, monitors, flat screens, scanners, printers, mobile phones, telephone handsets and photocopiers generated in 2002 and 2004. These estimates provide some idea of the important volume of residual materials generated by the IT sector and diverted for disposal and particularly, of the increase of these numbers over time. In 2002, 17,082 tons of target IT materials were disposed of in Québec; by 2004 that number had risen to 20,094 tons. Of that 2004 amount, 6,475 tons were desktop computers, servers and laptop computers, 7,568 tons were monitors, 5,029 tons were scanners and printers and 96 tons were mobile telephones.[10] While these figures do not include television sets, more and more such devices will likely be diverted for disposal in coming years due to the significant drop in the price of flat screen televisions that offer better image quality. Falling retail prices and greater accessibility of these higher quality devices that also offer bigger screens induces television set renewal and consequently, disposal of the oldest models. What's more, because of changes to signal transmission technology set for 2009, a significant increase in CRT television set discarding is predicted in the coming years.

[8] U.S. Department of Commerce and the Office of Technology Policy of the Technology Administration (2006), *Recycling Technology Products. An overview E-Waste Policy Issues*
[9] Statistics Canada (2005), *Telecommunication Statistics*
[10] Ris International Ltd, *Information Technology (IT) and Telecommunication Waste in Canada – 2003 update*

2.2 Potentially hazardous nature of certain components

Many electronic products are hazardous in nature as they contain substances such as lead, cadmium, beryllium and mercury and consequently present risks for human health and the environment if they are not appropriately managed at their end of useful life.

For example, glass from cathode ray tube screens can contain between 1.8 and 3.6 kg of lead depending on the tube size and year of manufacture.[11] Lead is a bioaccumulator and can enter the human body through the respiratory or intestinal tracts or through the skin, and attack the nervous system, kidneys and blood. Risks are limited as long as the lead remains imprisoned within a CRT that is in good condition. However, during the landfill process, cathode ray tubes can leach lead. More than 3,098 tons of lead from computers and CRT monitors were dumped in Canada in 2002.[12] Faced with this problem, numerous U.S. states have legislated to prohibit cathode ray tube screen disposal at landfills.[13]

Other metals used in the manufacture of electronic products are also of concern. This is notably the case for cadmium, beryllium, chromium and mercury. For example, while flat screens contain no lead, they do contain between 0.12 and 5.0 mg of mercury. In 2002, four tons of cadmium, eight tons of beryllium, three tons of chromium and one ton of mercury were added to landfill sites through computer and monitor dumping. These devices are thus not benign: it is known that exposure to high concentrations of cadmium and mercury in the environment has been respectively associated with chronic renal lesions and sensory or neurological deficiencies in humans and animals.[11]

Brominated fire retardants such as polybrominated biphenyls (PBB), polybrominated diphenyl ethers (PBDE), tetrabromobisphenol A (TBBPA) and hexabromocyclododecane (HBCD), also known commonly as flame inhibitors that reduce the flammability of plastics used in these kinds of devices, are found in various forms in electronic products. Personal computers contain approximately 1.7 kg of these products.[14] Environmental follow-up programs report an increase of certain PBDE concentrations in aquatic flora and fauna and in human maternal milk.[15] What's more, when they are incinerated and become airborne, brominated fire retardants may be carcinogenic and act to disrupt endocrine gland function and lead to, for example, problems with lactation, fertility or cerebral development.[12]

[11] RECYC-QUÉBEC (2006), Fact sheet. *Les information technologyet de la communication* (http://www.recyc.gouv.qc.ca)

[12] Ris International Ltd, *Information Technology (IT) and Telecommunication Waste in Canada – 2003 update*

[13] U.S. Department of Commerce and the Office of Technology Policy of the Technology Administration (2006), *Recycling technology Products: An overview. E-Waste Policy Issues.*

[14] Dannon Schaffer (2005), CHBE 550, *Advances in Reactor Design, A general Approach to Modeling the Movement of PBDEs from E-Waste*.

[15] R. J. Wenning (2002), *Uncertainties and data needs in risk assessment of three commercial polybrominated diphenyl ethers: probabilistic exposure analysis and comparison with European Commission results.*

It is equally worthwhile mentioning that the manufacture of a computer and its screen requires at least 22 kg of chemical products, 240 kg of fossil fuels and 1.5 tons of water.[16]

Mobile phone composition also varies from one model to another, but numerous elements are frequently to be found in them in the following approximate proportions: plastics (40%), glass and ceramics (15%), copper (15%), nickel (10%), potassium hydroxide (5%), cobalt (4%), lithium (4%), carbon (4%), aluminum (3%), steel and ferrous metals (3%), tin (1%) and other, minor, components such as Br, Cd, Cr, Pb, Mn, Ag, Ta, Ti, W, Zn, (<1%) and Sb, As, Ba, Be, Bi, Ca, F, Ga, Au, Mg, Pd, Ru, Sr, S, Y, Zr (<0.1%).[17]

It is, however, difficult for Québec to intervene directly with respect to the presence of harmful substances in consumer products since this responsibility generally is within the purview of the federal government.

Finally, it should be mentioned that in addition to reducing the emission of contaminants into the environment, diverting electronic products from landfill sites offers the added advantage of reducing pressure on natural resources. Solely for 1999, personal computers sent to Canadian landfill sites contained 4,400 tons of ferrous metals, 3,050 tons of aluminum and 1 500 tons of copper.[18]

3 GOVERNMENT INTERVENTION RELATIVE TO END OF USEFUL LIFE MANAGEMENT OF ELECTRONIC PRODUCTS

Environmental issues related to electronic products at their end of useful life has led to action on an international level. Firstly, the European directive concerning waste electrical and electronic equipment based on extended producer responsibility (EPR), targeting almost all electrical and electronic products throughout Europe that have reached their end of useful life, came into force in 2003. The 2006 directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment, commonly known as the RoHS directive (*Restriction of Hazardous Substances*), targets the use of lead, mercury, cadmium, hexavalent chromium, polybromobiphenyls and polybromodiphenyl ethers in electrical and electronic equipment sold in Europe. The Basel Convention that was adopted in 1989 and came into effect in 1992 is intended to control transborder movement and disposal of hazardous waste. Essentially, it seeks to prohibit the export of hazardous waste to countries that do not have secure waste disposal capabilities. In the United States, laws on the books in California, Maine, Maryland, Minnesota and Washington target recovery and recycling of electronic products throughout their jurisdictions.

Furthermore, in 2004, the Canadian Council of Ministers of the Environment (CCME) prepared Canada-wide principles related to the stewardship of electronic products. Of the

[16] Centre québécois de développement durable (2006), *Projet pilote CFER 3RV computers*
[17] Secretariat of the Basel Convention (2006), *Guidance document on the environmentally sound management of used and end-of-life mobile phones* (http://www.basel.int/meetings/frsetmain.php)
[18] Environment Canada (2006) *Mounting Concerns Over Electronic Waste.*
http://www.ec.gc.ca/EnviroZine/english/issues/33/feature1_e.cfm

12 declared principles, the first concerned EPR (see box). Since then, regulations aimed at recovery and reclamation of electronic products at their end of useful life have been adopted by British Columbia, Alberta, Saskatchewan, Ontario and Nova Scotia (see Table 2). Except for Alberta, the approach that was selected was EPR.

The EPR approach as used by these provinces may, however, differ somewhat from the Québec option, in particular when regulation does not provide for program performance objectives. In Québec, work began in June 2003 following the creation of a working group aimed at developing the features of a strategy relative to recovery and reclamation of IT products. This group was made up of 28 member organizations representing manufacturers, brandowners, distributors of electronic products, retailers, recovery and reuse entities, recycling and transformation enterprises, municipalities, Computers for Schools, the MDDEP, Environment Canada and RECYC-QUÉBEC. EPR has been designated as a preferred approach for this effort.

At the same time, many producers of electronic devices have come together in organizations like Electronic Product Stewardship Canada (EPSC)[19], an umbrella organization intended to enable industry producers to act as key partners throughout Canada for establishing and implementing regulatory measures, especially as regards EPR.

[19] Apple Canada Inc.; Agilent Technologies; Brother International Canada Ltd; Canon Canada Inc.; CIARATECH; Dell Canada; Epson Canada Ltd; Hewlett-Packard (Canada) Co.; Hitachi Canada Ltd; IBM Canada Ltd; Lenovo Canada Inc.; Lexmark Canada Inc.; LG Electronics Canada; Logitech; Microsoft Canada; MDG; Northern Micro Inc.; Panasonic Canada Inc.; Philips Electronics; Prosys-Tec; Samsung Canada; Sharp Electronics Canada Ltd; Sony Canada Ltd; Sprint Computer; Sun Microsystems and Toshiba Canada Ltd

CCME Principles for
Electronics Product Stewardship

1. Responsibilities associated with management of e-waste are primarily borne by producers of the products, where "producer(s)" means the manufacturer, brandowner or first importer of the product who sells or offers for sale the product in each jurisdiction.
2. Costs of program management are not borne by general taxpayers.
3. Environmental and human health impacts are minimized throughout the product life-cycle, from design to end-of-life management.
4. Management of e-waste is environmentally sound and consistent with the 4**R** waste management hierarchy:
    a. **R**educe, including reduction in toxicity and redesign of products for improved reusability or recyclability;
    b. **R**euse
    c. **R**ecycle
    d. **R**ecovery, of materials and/or energy from the mixed e-waste stream
5. Consumers have reasonable access to collection systems without charge
6. Education and awareness programs ensure that consumers, retailers and other stakeholders have sufficient information on program design and knowledge of their roles.
7. Program design and implementation will strive for equity and consistency for consumers, particularly between those who live in adjacent jurisdictions and between those who live in small, rural and remote communities and large urban centres.
8. Adjacent jurisdictions will strive for consistency in e-waste products collected.
9. Programs will include residential, commercial, historic and orphan products.
10. Programs will report on performance, specify objectives and targets, and be transparent in financial management.
11. E-waste is managed in the most economically and logistically feasible manner, while striving to maximize local economic and social benefits.

E-waste is exported from Canada for recycling only at facilities with a documented commitment to environmentally sound management and fair labour practices.

TABLE 2. CANADIAN PROVINCES – ELECTRONIC PRODUCT RECOVERY AND RECLAMATION REQUIREMENTS

Province	Regulation	EPR (Québec criteria)	Initial target products	Subsequently targeted products
British Columbia	*Recycling Regulation* (October 7, 2004) Amended February 16, 2006 (electronic products added) Collection began on August 1, 2007	Yes Choice of methods for collection, sorting and recycling Funding and stewardship left to industry	Desktop and laptop computers (including monitors, keyboards, mice and cables), printers, television sets Not targeted: vehicle or boat computers and television sets, commercial or industrial equipment	Not pre-determined
Alberta	*Designated Material Recycling and Management Regulation* (June 1, 2004) Collection began in October 2004	No Producers not involved Costs per device set by regulation Management conferred to a paragovernmental organization	Desktop and laptop computers (including monitors, keyboards, mice and cables), printers (including printer-fax machines and printer-scanners), television sets	Scanners, audio and video devices, telephones, mobile phones and other wireless devices, fax machines, electronic games[1]
Saskatchewan	*Waste Electronic Equipment Regulations* (February 1, 2006) Collection began on February 1, 2007	Yes Choice of methods for collection, sorting and recycling Funding and stewardship left to industry No objectives, no penalties, no accountability	<u>February 1, 2006</u>: Desktop and laptop computers (including monitors, keyboards, mice and cables), electronic agendas, printers (including printer-fax machines and printer-scanners), television sets	<u>February 1, 2007</u>: Television sets
Manitoba	*Electrical and Electronic Equipment Stewardship Regulation* Was subject to a public consultation public on June 25, 2007.		Desktop and laptop computers (including monitors, printers and other peripherals), pocket computers, mobile and classic telephones, television sets	

Province	Regulation	EPR (Québec criteria)	Initial target products	Subsequently targeted products
Ontario	Waste Electrical and Electronic Equipment designated under the *Waste Diversion Act,* published in the Official G*azette on January 1, 2005* December 20, 2004 letter of intent from the Minister to Waste Diversion Ontario (exhaustive list), replaced on June 11, 2005 (restrictive list) January 15, 2008 start of public hearings on the restrictive list program	Yes Choice of methods for collection, sorting and recycling Funding and stewardship left to industry No objectives, no penalties, no accountability Implementation delays subject to ministerial approval of program submitted by WDO and industry[2]	Phase 1 (restrictive list) expected to start in 2008: Desktop and laptop computers (including monitors, mice, keyboards), printers, television sets, fax machines	Phase 2 (expected to start in 2009): Mobile phones (cellular and classic) photocopiers, pocket computers, typewriters, modems, pagers, answering machines, amplifiers, audio reader/writers, preamplifiers, radios, receivers, speakers, turntables, video players
Nova Scotia	*Electronic Product Stewardship Regulation* adopted February 23, 2007 Start of collection: February 1, 2008	Yes Choice of methods for collection, sorting and recycling Funding and stewardship left to industry No objectives, no penalties, no accountability	February 1, 2008: Desktop and laptop computers (including monitors), printers, television sets	February 2009: Scanners, cellular and other telephones, fax machines

1. Listed in the regulation but with no effective start date
2. If industry refuses to act or submits an unacceptable program, implementation may be indefinitely delayed.

4 QUÉBEC MANAGEMENT OF ELECTRONIC PRODUCTS THAT HAVE REACHED THEIR END OF USEFUL LIFE

A number of collection, reuse and recycling systems for electronic products already exist in Québec. For 2004, it has been estimated that out of the total volume of IT residual materials that was generated, 28% was reused, 7%, warehoused, 6% recycled and 59%, disposed of.[20] However, it should be recalled that while reuse extends the useful life of a product, it will be discarded sooner or later, without possibility for further reuse.

In Québec, reuse is mainly taken care of by Computers for Schools and a few private enterprises specializing in the resale of products that essentially come from the institutional sector. Set up in 1993 and sponsored by Industry Canada, the Computers for Schools program makes it possible to refurbish computers and incidental equipment donated by governments and corporations for distribution to schools, libraries and not-for-profit learning organizations. Thus far, more than 750,000 computers have been placed in Canadian schools and libraries, and more than 100,000 are added to that figure each year.[21] In Québec, 130,000 computers have so far been donated in this way.[22] Through Computers for Schools, the Centre de services partagés du Québec donated more than 42,000 used computers and peripherals worth 4.9 millions dollars to Québec schools in 2006–2007.[23]

The Centres de formation en enterprise et récupération (CFER) are tasked with supporting young people in difficulty by offering them preparatory training for the job market. CFER centres work with Computers for Schools as reuse workshops and receive computers for inspection and refurbishing prior to their being reused by schools. In 2005, a CFER 4R computer pilot project in the Bellechasse, Saguenay, Outaouais and La Renaissance regions succeeded in recovering 43,158 cases, screens, printers, portables and peripherals. Of this number, 12,513 were reused (141,992 kg) and 30,645 were dismantled and diverted to recycling. A total of 13,746 kg of plastics, 4,135 kg of silica, 79,544 kg of ferrous metals, 46,164 kg of aluminum, 22,569 kg of copper, 7,181 kg of zinc, 3,283 kg of tin, 2,770 kg of nickel, 864 kg of lead, 103 kg of barium, 103 kg of manganese, 61.6 kg of silver, 51.1 kg of beryllium, 51.1 kg of titanium, 51.1 kg of cobalt, 30.6 kg of antimony, 30.6 kg of cadmium, 20.5 kg of bismuth, 20.5 kg of chromium, 7.17 kg de mercury, 5.21 kg of gold, 5.21 kg of selenium, 4.23 kg of arsenic and 0.98 kg of palladium were recycled.[24]

There are other electronic product recovery operations in Québec, as the RECYC-QUÉBEC repertory of recovery and recycling enterprises shows. However, their activity

[20] RECYC-QUÉBEC (2006), Fact sheet. *Les technologies de l'information et de la communication* (http://www.recyc.gouv.qc.ca)
[21] Industry Canada (2007) *Computers for Schools* (http://cfs-ope.ic.gc.ca)
[22] Computers for Schools Québec (2007) (www.opeq.qc.ca)

[23] Le Centre de services partagés du Québec (2007) *Rapport annuel de gestion 2006-2007* (http://www.cspq.gouv.qc.ca)
[24] Centre québécois de développement durable (2006), *Projet pilote CFER 3RV ordinateurs*

varies considerably from one to the other and no follow-up occurs. Most of them are basically collection sites while some perform some minor transformation. In many cases, these enterprises only accept products with a resale potential on the second-hand market, or restrict their activity to the dismantling of electronic components for purposes of metal recovery. However, some, such as ECOSYS Canada Inc., CTOU Informatique and FCM & Co. do stand out, either by the volume of their activity or through their initiatives. FCM & Co deserves particular mention for its recent acquisition of a high-end grinder for large volume processing of electronic products. Some of these companies also serve as intermediaries, shipping recovered materials for recycling outside of Québec or Canada.

Québec can also count on Recycling Noranda, an important final user of non-functioning or outdated computer and electronic equipment. The Noranda plants that utilise electronic products include the Horne Foundry in Rouyn-Noranda and the CCR refinery in Montréal. These units recover lead, copper and other precious metals. Recycling Noranda processed 150,000 tonnes of recyclable materials in 2000 including 50,000 tons of electronic waste,[25] and would no doubt be able to process a significant share of products diverted from landfills by the new regulation, but this would only concern metal recycling.

As far as cellular telephones are concerned more specifically, 43 tons worth were reused, 6 tons recycled 11 tons warehoused and 96 tons sent for disposal in Québec in 2004.[26] Among existing recovery programs is Bell Mobility's national Mobile Take-Back that collects used telephones, pagers, batteries, personal digital assistants and accessories for recovery, reuse or recycling. Between 2003 and 2005, this program collected more than 140,000 devices and more than 36.5 metric tons of batteries and accessories across Canada. Bell Mobility donates reusable cellular telephones to more than 130 women's shelters while units that are not reusable are recycled.[27] Other programs exist, like the Rechargeable Battery Recycling Corporation (RBRC) Call2Recycle that collects rechargeable batteries and cellular telephones. RBRC has 30,000 commercial and municipal collection sites in Canada and the United States.[28]

[25] EnvirosRIS (2000), *Les déchets de technologie de l'information et de télécommunications au Canada*
[26] Ris International Ltd, *Information Technology (IT) and Telecommunication Waste in Canada – 2003 update*
[27] Bell Mobility (2006), *FrequentlyAsked Questions* http://www.bell.ca/support/support/PrsCSrvWls_ClpRcle_FAQ.page
[28] Rechargeable Battery Recycling Corporation (2006), *Consumers: welcome page* www.rbrc.org/call2recycle/consumer/index.html

5 RECYCLING OF ELECTRONIC PRODUCTS

Based on Alberta product recovery data for the first year following the coming into effect of the *Electronics Designation Regulation* (October 2004–October 2005), Electronics Product Stewardship Canada (EPSC) has estimated Québec's annual potential recovery weight of electronic products. Quantities recovered in Alberta were first factored by a multiple of 2.33 to account for Québec's population of 7,598,100 compared to the Alberta figure of 3,256,800, then, recovered quantities of each product were multiplied by that product's average weight. Table 3 shows the estimated quantities and weights that could be recovered in Québec based on assumed recovery rates prorated to population compared to quantities recovered in Alberta after the first program year using the hypothesis that recovered equipment weights would be comparable. These estimates concern desktop computers, laptop computers, monitors, printers and television sets. They show that 8,767 metric tons of these products could be recovered in Québec as of the first year.

However, currently available figures are not sufficient to evaluate the recovery rate that this tonnage could represent compared to overall electronic product sales. To arrive at that number, additional products in line for initial phase designation that are not counted in the calculation would need to be added to the tonnage figure: electronic agendas and pocket computers, ink cartridges, scanners, fax machines, classic and cellular telephones. Finally, future phase target products would need to be factored into the data.

TABLE 3 Estimated IT quantities and weights that could be recovered in Québec

	Units recovered	**Average unit weight (kg)**	**Total weight (kg)**
Monitors	194,012	13.60	2,638,567
Desktop computers	178,417	13.50	2,408,635
Laptop computers	6,356	4.66	29,620
Printers	103,165	6.22	641,688
Television sets	101,625	30.00	3,048,764
Total			**8,767,274**

6 THE PROPOSED QUÉBEC REGULATION

This section covers specifics related to electronic products that will be the object of an appendix to the draft EPS framework regulation: the list of target products, objectives to be set, envisaged collection methods and implementation delays.

6.1 Target Products

The choice of regulatory designation of electronic products is based on a series of criteria that look to prioritize selected products. Among these criteria are the following:

- Continuous growth in consumption
- Short life cycles (an average of five years or less)
- Presence of hazardous matter such as heavy metals and flame retardants
- Significant numbers of units sold
- Reclamation potential
- Current disposal utilizes a non negligible landfill volume
- Harmonization with existing regulations across Canada

Phased electronic products designation is recommended concerning the implementation of recovery and reclamation programs. A first group of products will be targeted in the initial phase, and a second, later group also included in the appendix, but the recovery and reclamation programs should be established in a second phase. Following that step, other electronic products or product groups can be designated by adding them to the appendix on electronic products through regulatory change.

The following products would be covered by the first phase, as soon as the regulation comes into effect:

- Desktop computers, computer monitors, laptop computers, electronic agendas and pocket computers, printers, ink cartridges, servers, routers, scanners, fax machines, television sets as well as cellular, portable and classic telephones

Products that may be targeted in a second phase are as follows:

- Electronic game equipment, CD, DVD, MP3 and MP4 players, radios, amplifiers, digital cameras, digital video cameras, digital receivers, GPS devices and videotape machines.

It should be realized that any or all products that combine one or more of the functions of the products designated in the appendix on electronic products are also covered by it. Existing or future hybrid products that may come to market will be targeted as long as they include at least one of the functions of the designated products.

As well, connected products associated with the normal functioning of designated products such as keyboards, mice, cables, speakers, headphones, chargers, memory cards and remote controls must be accepted at collection sites for recovery and reclamation. This policy, in addition to increasing recovery and reclamation, will avoid obliging users who bring their electronic products back having to leave the collection site with material they directly associate with designated products still in hand.

The products targeted as much in the first as in the second phase are included in the list of products that, according to CCME, must be the object of a priority regulation aiming at their recovery and reclamation, except for electronic game consoles, MP3 players, cameras, video cameras, digital receivers, GPS devices, routers and scanners, which are recommended for future targeting. For its part, EPSC recommends initial targeting of desktop and laptop computers, monitors, printers and television sets. It should be recalled, however, that EPSC is first and foremost a grouping of producers of computer

products and as such, most cellular phone manufacturers are either not members or only recent members. Furthermore, most of the first phase products additional to those recommended by EPSC already are or will be designated in other provinces by the time the regulation comes into effect.

As for products covered in Phase Two, not all of the main players in affected industries participated in the IT working group discussions. Representatives from these sectors have been or will be consulted in the process of preparing a draft appendix or at the time of publication of the draft regulation in the *Gazette officielle du Québec*. Moreover, industry will have time to adequately prepare with respect to these products given, in particular, the implementation delays that will be included in the appendix.

Table 4 presents a summary by phase (1, 2 or 0 [not targeted]) of products envisaged by the MDDEP as compared to the CCME and EPSC recommendations. Overall, the products covered by the anticipated first and second phases include the EPSC list of suggested products for initial targeting and almost all of the products proposed by the CCME as initial targets, except for products such as turntables and cassette players. These products were not considered as priorities by the MDDEP due to sales approaching zero. No recovery objectives will be set for these products, but they will, however, be required to be accepted for reclamation at collection sites so that users are not forced to leave with these products in hand and a negative impression of the program in mind after they bring them in for processing along with other electronic products.

TABLE 4 Summary of priority target products

	MDDEP	CCME	RPEC
Office computers	1	1	1
Laptop computers	1	1	1
Computer screens	1	1	1
Printers	1	1	1
Ink cartridges	1	n.s.	n.s.
Electronic agendas	1	1	0
Pocket computers	1	1	0
Scanners	1	2	0
Fax machines	1	1	0
Television sets	1	1	1
Telephones	1	1	0
Cellular telephones	1	1	0
Routers	1	2	0
DVD players	2	1	0
CD players	2	1	0
Radios	2	1	0
Amplifiers	2	1	0
Electronic game equipment	2	2	0
MP3 and MP4 players	2	2	0
Cameras	2	2	0
Video cameras	2	2	0
Digital receivers	2	2	0
GPS	2	2	0
Videotape machines	2	2	0

0: Not targeted
1: priority 1
2: priority 2
n.s.: non-specified

6.2 Objectives

The list of objectives aimed at eliciting industry-implemented program performance will be included in the appendix. These objectives should be flexible and allow for modulation over time, considering the difficulty of predicting available-for-recovery product flux due to product nature and the constant evolution of the marketplace. In point of fact, electronic products have a functional lifetime of more than two years, generally speaking, but a useful life that varies as a function of user need. What's more, they exhibit undeclared possibilities for reuse and, finally, their acquisition cost leads to many consumers tending to keep them longer than necessary in the hope of some eventual profit. This suggests that it is difficult to ascertain what quantities may be available for recovery and what proportion of annual sales are for replacement purposes rather than

additional acquisition. What's more, the rapid technological evolution of these products means that the weight of units sold only a few years ago is hardly comparable to current product weight.

In order to arrive at realistic recovery objectives then, a twin path procedure is envisaged. On the one hand, regulated minimum objectives combined with a predetermined time period for ongoing improvement approach, will be set within the appendix. Different objectives may be set for some product sub-categories to take account of various factors such as consumer habits. On the other hand, a committee whose membership includes producers, RECYC-QUÉBEC and the MDDEP may propose longer-term objectives to the government. In its deliberations, this committee will consider data acquired in the initial years of program implementation. In this way, achievable objectives can be set with respect to market realities that both encourage performance and are adapted to individual target products or groups of products.

6.3 Service levels

The common stem of the EPR framework regulation provides to the common set of fundamental elements and minimum program implementation characteristics for all EPR programs, while the appendix will detail minimum required service levels such as the number and types of collection sites, accessibility criteria and service area. The appendix may also stipulate delays relative to a gradual implementation of services until required levels have been reached.

Collection sites must allow for free and unrestricted across-the-board access to Québec generators, whether they are from the municipal, industrial, commercial or institutional sectors. However, thresholds may be established for some products so as to determine the kinds or quantities of equipment for which special dispositions may be needed with regard to their collection. For example, the appendix may define product sizes or types eligible for curbside collection and stipulate if such services may be charged for.

6.4 Implementation delays

It is proposed that recovery and reclamation programs for electronic products targeted in the first phase are to be prepared in the course of the year following the coming into effect of the regulation. Recovery and reclamation would then begin approximately twelve months from the effective date of regulation enactment. Programs related to products designated in the second phase should be planned so as to allow for recovery and reclamation of these products two years after the regulation comes into effect. Transitional delays within these periods can be set so that producers can advise the Minister of their intent to either join an accredited organization or implement their own program and submit information relative to program implementation.

7 CONCLUSION

This report presents a picture of the situation that pertains to environmental management related to electronic products. Available data shows that significant quantities of electronic products are sold in Québec and that despite some recovery, reuse and recycling efforts, quantities sent for disposal are rising. Electronic products, in addition to more and more encumbering landfill sites, represent a threat to the environment due to the hazardous nature of some of their components.

The use of an EPR approach in the field of electronic products in Québec reflects an international trend that seeks to engage producers in responsibility for the products they sell that have reached their end of useful life. In fact, this approach is more and more acknowledged as being the most efficient one due in particular to the fact that producers are best placed to develop products that are easier to recover and recycle. The recommended approach also respects core principles established by the CCME and principally targets electronic products that have been designated as priorities. It also reflects the recommendations of the Québec IT working group, respects a fundamental principle of the Québec Residual Materials Management Policy 1998-2008 and follows up on one of its actions.

Extended producer responsibility (EPR)

Current status, challenges and perspectives

Part VI
Mercury lamps

March 2008

Développement durable,
Environnement
et Parcs
Québec

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INTRODUCTION

Mercury lamps are among the most efficient forms of lighting that exist. Until quite recently, they were not available to consumers except as fluorescent tubes, the kind that light most public and commercial buildings. Due to their dimensions, form and type of light they produce, fluorescent tubes were not common in homes, where their use was mostly reserved for the basement or garage. Elsewhere in the home, incandescent bulbs that corresponded better to household lighting needs were employed.

However, the arrival of mercury fluorescent-compact lamps that fit the same sockets as incandescent bulbs has changed consumer habits. Encouraged by energy-saving programs, households now make these lamps their choice more and more often. This trend will likely continue to accelerate in Canada in the coming years since the federal government announced that it will ban low performance lamps (of which the majority are incandescent bulbs) by 2012.

Furthermore, mercury is a toxic element whose harmful effects on human health and ecosystems are well documented. However, mercury is also an essential element in fluorescent bulbs and other mercury lamps, and there is no current substitute that is as efficient or emits as high a quality of light. Since mercury is a hazardous substance, used mercury lamps are classified as hazardous household waste or HHW.

Due to the growth in the use of mercury lamps, it is important to immediately improve methods available to consumers to enable these products to be discarded in a safe manner. The Extended Producer Responsibility or EPR approach to this problem was recommended in the Québec Residual Materials Management Policy 1998-2008 in order to ensure the implementation of HHW recovery and reclamation programs and is the best option available to achieve that goal.

It is therefore proposed to add an appendix dealing with mercury lamps to the EPR framework regulation. In order to clarify the context, the present document describes the environmental issues associated with mercury, the agreements that bind governments that target reducing its presence in the environment and the place held by fluorescent lamps in the struggle against greenhouse gas emissions. This picture will be complemented by examples of management tools adopted in various countries, provinces or states and a portrait of the presence of fluorescent lamps in Québec, including quantities in use and the success rates of recovery and recycling methods that are available. Finally, the thrust of specific regulatory dispositions concerning mercury lamps will be described.

1 DESCRIPTION OF MERCURY LAMPS

There exist a number of categories of mercury lamps of which the two most widely used are fluorescent lamps, that include fluorescent tubes and the compact fluorescent lamp (CFL), and high intensity discharge (HID) mercury lamps, that include mercury vapour lamps, halogen lamps and sodium vapour lamps. Various other types of mercury lamps intended for specialized usage are also produced, including short arc lamps and capillary lamps.

Classical fluorescent tubes are made from a glass tube that is coated with phosphorus and has metallic electrodes at each end. This type of tube contains small amounts of mercury including mercury vapour. If model, date of manufacture and manufacturer are considered, industry sells more than 5,000 types of fluorescent bulbs in North America. T-8 and T-12 fluorescent tubes four feet in length alone accounted for 75% of these tubes in 2004. They are the most widespread types mercury lamps, and are used essentially in industrial, commercial or institutional facilities (ICI)[1] with nearly one third being type T-8.

CFLs are mostly employed in the residential sector, and are manufactured from the same materials as fluorescent tubes. Variable in format, they are designed to take the same space as incandescent bulbs and fit the same sockets.

HID lamps work on the same principle as fluorescent lamps but do not require phosphorous powder. They contain a gas, usually xenon, argon or mercury, to which another substance has been added, usually a halide, mercury vapour or sodium under high pressure, and are used above all for street lights or industrial and commercial lighting.

Table 1 shows the weight, average life expectancy and mercury content for each of these lamps.[2]

[1] C. Hilkene and K. Friesen, 2005. *Background study on increasing recycling of end-of-life mercury-containing lamps from residential and commercial sources in Canada*. Pollution Probe. http://www.pollutionprobe.org/Reports/merclampsreport.pdf

[2] Environment Canada, *Mercury-Containing Products. Fact sheet #21 on Pollution Prevention*, Ontario Region – Environment Protection Branch. http://www.on.ec.gc.ca/epb/fpd/fsheets/4021-e.html

Table 1. Weight, life expectancy and mercury content of mercury lamps

Lamp type	Weight (kg)	Life expectancy (hours)	Mercury content (mg)
CFL	N.A.	Up to 10,000	1–25
U-shaped tubes	N.A.	10,000–20,000	3–12
Fluorescents tubes (4')	0.3125	10,000–20,000	
Fluorescents tubes (8')	0.6325	10,000–20,000	
Reduced mercury content			3–12
Unreduced mercury content			10–50
HID lamps	0.220	20,000–27,000	
Mercury vapour lamps			
75 watts			25
1,500 watts			225
Halide lamps			
75 watts			25
1,500 watts			225
Sodium vapour lamps			
35 watts			20
1 000 watts			145

2 MERCURY-RELATED ENVIRONMENTAL ISSUES[3]

2.1 Toxicity of mercury

The toxicity of mercury has been known since antiquity. The toxic effects of metallic mercury on humans depend on the individual's physical state and exposure tract. If mercury in its liquid form is not easily assimilated through the digestive system, its vapours are, by contrast, easily absorbed through the respiratory tract and are soluble in the blood, blood plasma and haemoglobin. Once in the blood stream, mercury can affect the kidneys, brain, even the entire nervous system. Since mercury is fat-soluble, it can easily cross the placenta barrier and is of risk to foetuses. In addition, mercury is excreted in maternal milk and represents a danger to newborn infants. Finally, since mercury is a persistent pollutant, once released into the environment, it can affect a number of generations.

When atmospheric mercury falls to earth, it may be transformed into methylmercury, a more toxic form than the initial metallic airborne molecules. Methylmercury accumulates throughout the life of living organisms exposed to it. Additionally, through the process of bioamplification, mercury becomes more and more concentrated as it moves up the food chain hierarchy, beginning with microorganisms, then moving to fish and predators at the top

[3] A more detailed description of this issue may be found in *État de situation des rejets anthropiques de mercure dans l'environnement au Québec* on the MDDEP Website:
http://www.mddep.gouv.qc.ca/matieres/mercure/mercure.pdf

of the food chain, including man. High levels of methylmercury can lead to a decline of affected animal species and be harmful to human health. This was seen in Minamata, in Japan, where the consumption of fish that had toxic levels of methylmercury claimed nearly 2,000 victims over a number of decades.

While mercury is present in the earth's crust and can be released into the atmosphere by natural phenomena, it is generally recognized that atmospheric mercury emission is mainly due to human activity. Coal-fired thermal power plants, metallurgical and chloralkali production industries as well as waste are widely recognized as the most important sources of atmospheric mercury emissions on our planet. In Québec, the principal source of mercury emissions comes from residual materials..

2.2 The struggle against climate change

The plan for the struggle against climate change in Québec is founded on four principles that aim at Québec's shouldering its responsibilities in its own fields of competence, economic efficiency in order to preserve the competitiveness of Québec entreprise and the complementarity of intervention. The choice of high-energy performance lighting products is compatible with the principles of this action plan.

Among lighting products available to consumers are incandescent bulbs, halogen lamps, fluorescent tubes and, in the last decade, compact fluorescent lamps. Incandescent bulbs are the most widely used and the least efficient household lighting products, since only 5–8% of their input energy is transformed into lighting. Fluorescent tubes consume between 60 and 80% less energy than incandescent bulbs, but are not socket-compatible. By contrast, CFLs are socket-compatible and their energy consumption is similar to that of fluorescents tubes.

Since this product is suitable for all households and allows for energy savings, CFL purchase is strongly encouraged by energy suppliers including Hydro-Québec and the government agencies that manage energy efficiency programs. Thus, cashback programs are available to consumers who want to purchase CFLs, which are more expensive to buy than classical light bulbs. Additionally, on April 25, 2007, the federal Minister of the Environment announced that incandescent bulbs, with some exceptions, would be banned in Canada by 2012, in order to curtail greenhouse gas emissions. Ontario has also announced a similar strategy and forecasts that 87 million incandescent bulbs will be replaced by CFLs, resulting in energy savings of six million megawatt-hours, the equivalent of the electricity consumption of 600,000 Ontario households. For Ontario, which produces electricity using coal-fired thermal power plants, this energy savings will result in a reduction in greenhouse gas emissions equivalent to taking 250,000 cars off the road. As Québec produces its electricity essentially by hydroelectric or wind generation, it cannot hope to significantly reduce greenhouse gas emissions within its territory through changes in the weak energy consumption of fluorescent lamps.

Furthermore, in places where electricity is produced from coal – a combustible that contains mercury – CFL bulbs may help diminish atmospheric mercury emissions even though they effectively contain mercury. For five years' worth of lighting supplied by an incandescent

bulb, a coal-fired power station releases 10.0 mg of mercury into the air, but only 2.4 mg for equivalent lighting supplied by a CFL that contains 4 mg of mercury.[4] The CFL thus requires 6.6 mg of mercury from the time of manufacture to its end of useful life compared to 10 mg for an incandescent bulb. It should be said however, that for Québec, if a compact fluorescent lamp replaces an incandescent bulb and is not recovered at its end of useful life, there will be excess mercury released into the environment since the main sources of electrical energy production here are mercury-free. This added amount of mercury could amount to 400–500 kg, and be the most important source of mercury in household products. Paradoxically, the Québec public is generally unaware of the fact that the low energy lamps it purchases contain mercury.

3 GOVERNMENT INTERVENTION WITH RESPECT TO MERCURY LAMP MANAGEMENT

This section presents a non-exhaustive portrait of government intervention with respect to the management of mercury lamps and includes a brief description of intergovernmental agreements that concern mercury. Certain U.S. states and various countries were selected for purposes of illustration in order to cover a wide range of management modes, going from all-volunteer programs to programs targeting recovery and recycling through laws that set objectives to be attained. These examples come from the United States, Europe, Asia and Canada.

3.1 U.S.A.

In the United States, used lamps are treated as hazardous waste under the *Resource Conservation and Recovery Act*[5] and may not be disposed of in landfills. Additionally, since 1999, mercury lamps appear on the list of universal waste.[6] The rules for the storage, transportation and recovery of fluorescent lamps are less stringent than those that apply to other hazardous waste. A number of U.S. states including California, Minnesota, Wisconsin and Florida have issued regulations that complement federal laws and have also prohibited disposal of these lamps in landfills.

Furthermore, the United States has set an objective of gradually increasing the rate of recycling of mercury lamps so as to reach 80% by 2009. In order to induce this target being met, the U.S. Environmental Protection Agency implemented a national education and awareness program. In Phase 1, the EPA signed agreements with groups like the Association of Lighting and Mercury Recyclers (ALMR), the Solid Waste Association of North America (SWANA) and the Northeast Waste Management Officials' Association in order for them to

[4] US EPA. *Fact sheet: Mercury in compact fluorescent lamps (CFLs)* www.nema.org/lamprecycle/epafactsheet-cfl.pdf
[5] U.S. Code Home. *Title 42 – The public health and welfare – Chapter 82 – Solid waste disposal* http://www.access.gpo.gov/uscode/title42/chapter82_.html
[6] U.S. Environmental Protection Agency. *Universal Waste – Lamps* http://www.epa.gov/epaoswer/hazwaste/id/univwast/lamps/lamps.htm

prepare awareness tools such as fact sheets, data bases and Websites. In Phase 2 of the program, the EPA will mandate organizations like the Tennessee Department of Environment and Conservation, the California Department of Toxic Substances Control and the Vermont Department of Environmental Conservation to educate their populations and adapt the support material prepared during Phase 1. The increase from 2% to 24% in the rate of recycling of mercury lamps in the United States between 1990 and 2004 has been partially attributed to the education and awareness programs brought forward by the EPA and collaborating organizations, in particular the National Electrical Manufacturers Association (NEMA) and the ALMR.[7]

In addition to the broad national programs, state programs in the field of mercury lamp recycling have also been implemented; an example is the Northeast states tanning bed mercury lamp awareness program.[8]

3.2 Europe

Among the measures implemented by European countries with respect to mercury lamp management, European Community directive 2002/96/EC on waste electrical and electronic equipment (WEEE–adopted in January, 2003) is worth mentioning.[9] In this directive, the European Union (EU) sets measures targeting the prevention of electrical and electronic waste, including mercury lamps, as well as promoting their reuse, recycling and reclamation in other forms. The directive additionally aims at reducing the amounts of waste requiring disposal while improving the environmental performance of economic agents involved in their management.

This directive is founded on EPR principles and makes producers of electrical and electronic equipment responsible for implementing and funding systems for the collection, processing and reclamation of their products, as well as for supplying data to legislatures and keeping citizens informed. It also sets recovery objectives that producers must achieve. Concerning lighting products subject to this directive, including mercury lamps, the 2006 objective was a recovery rate of 80%. The accompanying RoHS Directive 2002/95/EC (*Restriction of Hazardous Substances)*,[10] aims at curtailing the use of certain toxic substances such as mercury in electrical and electronic equipment sold in Europe.

[7] ALMR, NEMA, SWANA. *Information on mercury lamp management* http://www.almr.org/support_files/messageforall.htm

[8] *Tanning Bed Lamps Out? Recycle* http://www.des.state.nh.us/NHPPP/Mercury/tan_bed_flier_NH.pdf

[9] European Directive 2002/96/CE of the European Parliament and Council of January 27, 2003 on Waste electrical and electronic equipment (WEEE), Official Journal of the European Union 13.2.2003 L37/24 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:037:0024:0038:EN:PDF

[10] European Directive 2002/95/CE of the European Parliament and Council of January 27, on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment, Official Journal of the European Union 13.2.2003 L37/19 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:037:0019:0023:EN:PDF

Most European countries were slow in moving towards this system and consequently, it is quite likely that the objective for recovering lighting materials has not been met throughout the union. France, for example, adopted a decree to this end in June 2005 and the accredited French entity for organizing the collection and recycling of used fluorescent lamps has stated that as of the beginning of 2007, nearly 14 million of the 80 million lamps discarded annually were collected and recycled, which made the percentage only 18% in this case.[11]

However, European countries have long been concerned about the disposal of mercury lamps, particularly since their waste is generally incinerated. Consequently, most of these countries treat mercury lamps as hazardous materials and prohibit their disposal in incineration facilities or landfill sites.

3.3 Asia

Two Asian countries, Taiwan and Japan, have enacted laws similar to European laws targeting the recovery and recycling of electrical and electronic equipment. For its part, Korea has extended EPR to a number of these products. The regulation adopted by Taiwan with respect to electrical and electronic products includes fluorescent lamps since 2002. The impact of this regulatory tool was quickly felt. In 2003, 7,800 tons of fluorescent tubes were recycled out of a total annual consumption of 8,900 tons–equivalent to a recycling rate of 87%, while in 2002 the rate of recycling was hardly 6%.[12] The implementation of Japanese legislation relative to fluorescent lamps is too recent to measure its performance.[13] The same is true for Korea: its *Act on the Promotion of Saving and Recycling of Resources* was amended in 2006 in order to extend EPR to 15 products, including fluorescent lamps.[14]

3.4 Canada and Canadian provinces

The Government of Canada has adopted a number of non-regulatory measures targeting mercury lamps. Under the Harmonization Accord, the Canadian Council of Ministers of the Environment (CCME) adopted, in 2001, the Canada-wide Standard on Mercury-containing Lamps.[15] This standard seeks an 80% reduction in mercury content in these lamps by 2010 compared to their mean 1990 content of 43 mg. The 2005 Report on Progress[16] on the

[11] Récylum. *La filière des lampes usagées* http://www.recylum.com/collecterecyclage.htm
[12] Chiu Yu Tzu. *Tube recycling system launched*, Taipei Times, 30 octobre 2004 http://www.taipeitimes.com/News/taiwan/archives/2004/10/30/2003208949
[13] Ministry of Economy, Trade and Industry. *Law for promotion of effective utilization of resources*, October 2001 http://www.meti.go.jp/english/information/data/cReEffecte.html
[14] Ministry of Environment Republic Korea. *Act on the Promotion of Saving and Recycling of Resources* http://eng.me.go.kr/docs/news/press_view.html?seq=275&mcode=&page=8
[15] CCME, 2001. The Canada-wide Standard on Mercury-containing Lamps http://www.ccme.ca/assets/pdf/merc_lamp_standard_e.pdf
[16] CCME, 2005. Canada-wide Standards for Mercury, A Report on Progress http://www.ccme.ca/assets/pdf/joint_hg_progress_rpt_e.pdf

implementation of this standard indicated that average mercury content per lamp had fallen to 11.4 mg by 2005, a 73% drop compared to the 1990 level, making it possible to achieve the interim objective of 70% set for 2005. The Government of Canada also seeks to encourage the replacement of mercury lamps and the use of high efficiency and low mercury-content lamps in accordance with federal programs. The Canadian Minister of the Environment also announced on April 25, 2007, that incandescent bulbs, with some exceptions, would be banned in Canada by 2012 in order to curtail greenhouse gas emissions. This measure will lead to incandescent bulbs being replaced by higher performance lighting products including the compact fluorescent lamp. Environment Canada also cooperated with other authorities to promote the development of lamp recycling infrastructure throughout the country by means of economic incentives.

Also, in December 2006, Environment Canada submitted a risk management strategy for mercury-containing products for consultation, and proposed adopting a regulation pursuant to Section 93 of the 1999 Canadian Environmental Protection Act.[17] This regulation would allow Environment Canada to prohibit mercury-containing products whenever alternative non mercury-containing products exist, prohibit the use of mercury in new products that are not currently available on the Canadian market, impose restrictions on the amount of mercury used in products for which no mercury-free alternative exists, apply Extended Producer Responsibility to mercury-containing products that come to the end of their useful life cycle and set labelling requirements for mercury-containing products. Complementary tools have also been envisaged, such as mandating pollution prevention plans, codes of practices and product inventories.

Canadian provinces that are signatories to the standards have taken a variety of steps with respect to the recycling of used fluorescent tubes. These steps run from simple encouragement to the implementation of programs or initiatives targeting the setting up of recycling facilities. Alberta, in collaboration with the recycling industry and the City of Calgary, in 2001 launched a two-phased voluntary initiative called *Partners in Recycling* in order to increase the rate of recovery and recycling of tubes and lamps. The first phase of this program, begun in February 2001, targeted municipalities, universities, schools and hospitals while the second, begun in 2002, broadened the program's scope to ICI at large. The first phase that aimed for a 75% recycling rate for used fluorescent lamps by the end of 2002, achieved a 23% rate at term; results for Phase 2 are not yet available. Table 2 shows the legislative measures adopted by Canadian provinces targeting recovery and recycling of mercury lamps. These measures introduce a mechanism for designating products based on a framework regulation (British Columbia and Manitoba) or a framework law (Ontario).

Thus, in October 2004, British Columbia adopted a framework regulation based on EPR that requires industry to implement a recovery and recycling program for various products, and on June 26, 2007, announced that it might add mercury lamps to the list of products subject to this regulation. On June 25, 2007, Manitoba, for its part, submitted a draft framework regulation based on EPR for consultation, aimed at hazardous household material including

[17] Environment Canada, 2006. Risk Management Strategy for mercury-containing. *CEPA Environmental Registry*, published December 20, 2006, subject to public consultation until March 31, 2007. http://www.ec.gc.ca/RegistreLCPE/documents/part/Merc_RMS/Merc_RMS.cfm

fluorescent tubes and CFLs.[18] That province accepted comments until November 13, 2007. Additionally, on December 11, 2006, Ontario designated hazardous municipal and special waste (HMSW) as residual materials requiring a diversion program pursuant to the Waste Diversion Act. This program should be funded from fees paid by responsible industry. Ontario has set out a number of phases for completing the program, with each phase targeting a specific list of products; the second phase includes mercury lamps, among other products. A proposal for a program covering materials targeted by the first phase was submitted for public consultation until July 11, 2007 (Table 2).

3.5 Inter-governmental agreements

Mercury was the subject of specific agreements between countries aimed at curtailing its presence in the environment. These agreements are often the source of intervention with respect to the management of products containing mercury, including lamps. Mercury was thus included in the United Nations Protocol on Heavy Metals that came into force in December 2003. This protocol, which was ratified by Canada in 1998, seeks, among other things, to reduce mercury emissions by proposing emission limits on major sources that encourage the use of best emission processing technologies and, if possible, the elimination of mercury at its source.

The North American Commission for Environmental Cooperation (CEC) has also adopted a mercury action plan for North America based on a number of undertakings on the part of Canada, the United States and Mexico. The ultimate objective of this plan is to reduce anthropogenic mercury emissions to levels naturally present in the environment. This action plan also includes various features concerning pollution prevention including abandoning the use of mercury in the manufacture of certain products.

[18] Manitoba conservation public consultation draft. *Proposed Hazardous or Prescribed Household Material Stewardship Regulation under The Waste Reduction and Prevention Act* http://www.gov.mb.ca/conservation/pollutionprevention/waste/pdf/hazardous_prescribed_household_material_stewardship_consultation_document_jun_%2025_cw5.pdf

Table 2. Legislative Measures targeting the recovery and the recycling of mercury lamps in Canadian provinces

Province	Law, regulation or draft regulation	Mechanism for product designation	Designation status	Follow-up
British Columbia	*Environmental Management Act* (2004-10-07) *Recycling Regulation*	EPR framework regulation Product designation by regulatory amendment	Not identified in a list of nine potentially designated products	Two products to be selected on a priority basis from a list of nine products submitted for public consultation in the fall of 2007
Manitoba	*Waste Reduction and Prevention Act* *Proposed Hazardous or Prescribed Household Material Stewardship Regulation*, (2007-06-25)	EPR draft framework regulation Regulatory amendment required for new product designation Deadline for comments on designated products: 2007-11-13	Designation date TBA	N.A.
Ontario	Waste Diversion Act (2002-06)	Authorizes Minister to designate products to a government agency without amending the law.	2006-12-11: Phase 2	Phase 2: program submission date to be decided subsequent to approval of Phase 1

Mercury, which is on the list of toxic substances of the Canadian Environmental Protection Act, is also the subject of agreements between the Government of Canada and the provinces, through the Canadian Council of Ministers of the Environment (CCME). The CCME prepared Canada-wide mercury standards with respect to coal-fired thermal power plants, mercury lamps and dental compounds. Québec is not a signatory to this accord but shares its objectives.

Québec is signatory to the resolution concerning mercury and its effects on the environment that was adopted in 1998 by the Conference of the New England Governors and the Eastern Canadian Premiers (NEG-ECP). Under this agreement, Québec participates in the implementation of a regional action plan and is currently preparing a Québec action plan aimed at curtailing the amount of mercury released into the environment and developing safe mercury-containing consumer product waste management, education and information, research, analysis and oversight.

4 MANAGEMENT OF MERCURY LAMPS AT THEIR END OF USEFUL LIFE IN QUÉBEC

Some programs relating to fluorescent tube recovery and recycling have been implemented in the ICI sector in Québec, including the Société immobilière du Québec's (SIQ) action plan targeting the recovery and recycling of fluorescent tubes in buildings under its management. In November 2006, fluorescent tubes were recovered and recycled in 39 government buildings that are among the most important in the Capitale Nationale, Montréal and Outaouais regions. Hydro-Québec has also implemented a program under which fluorescent tubes from its buildings are recovered at 500 household hazardous waste collection sites throughout the province. Four private companies send fluorescent tubes from these sites to recyclers. Additionally, BOMA (Building Owners and Managers Association), of which the SIQ is a member, has implemented two certification programs requiring participants to handle the recovery and recycling of their fluorescent lamps. More than 80 buildings have obtained BOMA certification under these programs. Additionally, a number of establishments including the Collège de Rosemont have taken the initiative to add used tube return and recycling to their fluorescent tubes supply tenders. Consultations held in 2004 in the health and education sphere also revealed that 12% of health establishments and 25% of school boards had a fluorescent tube recovery program. However, mercury lamp management programs in the above-mentioned ICI sector only cover lighting products. To our knowledge no program exists that covers specialized mercury lamps, for example those used by tanning salons.

Furthermore, between 1991 and 1994, Québec also ran a mercury luminaire replacement program that resulted in 30,600 mercury lamps (almost all the mercury lamp luminaires in the ministère des Transports inventory) being removed from service and processed.

No specific program covering the whole of Québec targets the recycling of fluorescent tubes and CFLs in the residential sector. HHW collection systems set up by municipalities, such as curbside collection days, mobile units and permanent depots are thus the only means available for safely discarding them. The situation may improve however, since a major chain of hardware stores announced in the fall of 2007 that it intended to implement a fluorescent lamp recovery program in its stores in a number of regions in Québec.

Furthermore, Hydro-Québec, through its Website and promotional tools, encourages its clients to return old fluorescent tubes and CFLs to a recovery centre or to discard them during collection of household hazardous waste (HHW).[19]

It is worthwhile mentioning also that at the end of January 2007, RECYC-QUÉBEC brought together a number of stakeholders in order to discuss the issue of fluorescent lamp recovery and recycling in Québec. At the conclusion of this meeting, RECYC-QUÉBEC indicated that it would intervene with municipalities and main suppliers of lighting products in order to encourage the implementation of a system for collecting and recycling fluorescent tubes and CFLs in the ICI and municipal sectors.

4.1 Sales of fluorescent lamps in Québec

No specific figures are available on the sales of fluorescent lamps in Canada or in Québec. Based on U.S. data, the CCME believes that in 2001, 300 million units of all categories of these lamps were in use in Canada with a further 60 million being sold annually,[20] of which, based on relative population size, 14 million would have been sold in Québec. In 2004, more than 75% of these lamps were 48" tubes intended for the ICI sector. Using the supposition that the weight of 48" tubes fairly represents the population of fluorescent lamps sold and replaced and that the quantity of fluorescent tubes sold is invariable, it can be calculated that 4,400 tons of fluorescent tubes are discarded each year in Québec. If average mercury content of these lamps is between 10 and 20 mg, these used lamps used would contain from 140 to 280 kg of mercury.

Even though numbers are smaller than for the ICI sector, a certain quantity of fluorescent tubes is found in the residential sector. According to the Office of Energy Efficiency 2003 Survey of Household Energy Use (SHEU),[21] 51% of Québec households used at least one fluorescent tube. Since the number of Québec households has been estimated at 3.25 million in 2006,[22] simple calculations reveal that more than 1.5 million such tubes are present in our

[19] Hydro-Québec. *Recycle to Protect the Environnement*
http://www.hydroquebec.com/residential/energywise/recyclage.html
[20] CCME, 2001. *Canada-wide Standards for Mercury-Containing Lamps*
http://www.ec.gc.ca/MERCURY/MM/EN/mm-cws.cfm#mcl
[21] The Office of Energy Efficiency, *2003 Survey of Household Energy Use (SHEU) - Summary Report*, Natural Resources Canada, December 2005
http://oee.nrcan.gc.ca/Publications/statistics/sheu-summary/pdf/sheu-summary.pdf
[22] Institut de the statistique du Québec. *Faits saillants de l'évolution projetée des ménages privés au Québec, 2001-2051* http://www.stat.gouv.qc.ca/donstat/societe/demographie/persp_poplt/menages/faits_saillants.htm

homes. Since these tubes are replaced on average every 10 years, we can deduce that around 150,000 fluorescent tubes are sold each year in the residential sector in Québec, slightly more than 1% of the 14 million total. The survey also showed that in 2003, 24% of households used at least one CFL, for a minimum total of 780,000 CFL units. But this number was on the rise, with CFLs gradually replacing incandescent bulbs without any regulatory involvement whatsoever. According to the survey, Canadian households used an average of 26.4 incandescent bulbs. For Québec households overall, 85.8 million CFLs could thus replace all incandescent bulbs. Using a five-year replacement schedule, in can be expected that 17 million compact fluorescent lamps may be discarded annually in the future. This number is greater than the current total of fluorescent lamps sold each year in Québec. Taking average CFL mercury content as 5 mg, for each million of these lamps sold in Québec, the amount of mercury generated by Québec households would rise by 5 kg.

4.2 Manufacturers of mercury lamps

Manufacturers of lighting products are represented in Canada by Electro-Federation Canada (EFC), a national non-profit association whose membership includes manufacturers, distributors and service providers in the fields of electrical, electronic and telecommunications products. Among its members are GE Lighting, OSRAM Sylvania Ltd, Panasonic Canada Inc. and Philips Lighting, which together account for more than 90% of all lamps sold in Canada.

Of this group, only OSRAM Sylvania of Drummondville has a production plant in Québec. This company mostly produces T-12 fluorescent tubes as well as some specialized models; its plant has an annual capacity of 36 million units. It has recently modernized its facility and installations and diminished its emissions of mercury released in the manufacturing process from 72 kg in 2004 to an estimated 8.9 kg in 2005.

4.3 Mercury lamp recoverers

The Répertoire québécois des récupérateurs, recycleurs and valorisateurs[23] includes the names of more than 20 entreprises or ecocentres that indicate fluorescents among their recovered products. As a rule, most HHW recoverers should accept fluorescents. It is specifically worthwhile mentioning Relampage 5E, a company that is very active in the collection and recycling of fluorescent lamps. Located in Saint-Eustache, Relampage 5E is specialized in the maintenance and replacement of lighting materials and in the collection and transport of lighting waste. This company sends the waste to a recycler with which it is associated. A Relampage 5E initiative has led to a major distributor of lighting products, also located in Saint-Eustache, adding tube replacement, collection and recycling to its sales contracts.

[23] RECYC-QUÉBEC. *Répertoire québécois des récupérateurs, recycleurs et valorisateurs* http://www.recyc-quebec.gouv.qc.ca/client/fr/repertoires/rep-recuperateurs.asp

Fluorescent lamp transport can be handled by recovery enterprises, as is the case with the three previously mentioned companies that specialize in the recovery of fluorescent lamps intended for recycling, or by HHW transporters. When the used fluorescent lamps are destined for recycling, the transporter is not required to hold a Québec hazardous materials permit.

4.4 Mercury lamp recyclers

In Québec, two entreprises offer mercury lamp recycling services: Contech, in Dorval, affiliated with Fluorescent Lamp Recyclers (FLR) (Now called *Aevitas*) that possesses recycling facilities in Ayr, Ontario, and Recyclage de lampes fluorescent AAZ inc. (RLF), that recycles mercury lamps at its facilities in Côteau-du-Lac, Québec.

5 RECYCLING OF USED FLUORESCENT LAMPS

This section is based on figures contained in an October 31, 2005 study produced for Environment Canada by Pollution Probe, a non-governmental organization dedicated to the protection of air and water quality.[24] Since Canadian and Québec consumption habits are similar, the data from this study has been converted to Québec figures, as needed, by taking the comparative populations into account.

5.1 Composition of fluorescent lamps

Fluorescent tubes four feet in length are composed of approximately 0.26 kg of glass, 0.02 kg of various metals and 0.01 kg of phosphorus; they also contain about 11.6 mg of mercury.[25] CFLs contain between 1 and 25 mg of mercury with an average of 4–5 mg, and HID lamps, from 20 to 225 mg (Table 1).

NEMA, the industry association for U.S. distributors of lighting products, has calculated that in 2004,[26] its members placed 76% of total mercury used in the manufacture of lamps in fluorescent tubes, 4% in CFLs and 19% in HID lamps, with the remaining 1% essentially going into special use short arc lamps for medical equipment, photochemistry and spectroscopy. These figures show that in 2004, CFLs accounted for only a marginal amount of the mercury used in the manufacture of lamps.

[24] C. Hilkene & K. Friesen, 2005. *Background study on increasing recycling of end-of-life mercury-containing lamps from residential and commercial sources in Canada*, Pollution Probe http://www.pollutionprobe.org/Reports/merclampsreport.pdf

[25] C. Hilkene & K. Friesen, 2005. *Background study on increasing recycling of end-of-life mercury-containing lamps from residential and commercial sources in Canada*, Pollution Probe http://www.pollutionprobe.org/Reports/merclampsreport.pdf

[26] NEMA. *Mercury use in lighting* http://www.newmoa.org/prevention/mercury/imerc/factsheets/lighting.pdf

5.2 Recycling rate

In 2004, only 7% of mercury lamps were recycled in Canada, with the rest being sent to disposal sites. Consultations with Québec recyclers indicate that the rate of recycling in the province was similar to the overall Canadian rate for that year. However, there has been a recent rise in the rate of recycling of fluorescent tubes in Québec that, according to initial 2006 estimates, yet remains below 20%.

The 2004 rate in Québec resulted in the recycling of approximately one million lamps out of the 14 million discarded total, or about 300 tons. More than 90% of this amount was in fluorescent tubes. The weight of recycled CFLs was less than ten tons while the combined weight for other mercury lamps including HIDs, high-pressure sodium lamps (HPS) and low-pressure sodium (LPS) was close to 20 tons. CFLs accounted for around 3% of recycled mercury lamps by weight and HID, HPS and LPS lamps, around 7%.

According to the statement of RECYC-QUÉBEC, only 18 tons of fluorescent lamps (6% by weight of all fluorescent lamps processed by recyclers) were recovered in 2004 by Québec municipal collection systems.

5.3 Recycled materials

The processes for recycling mercury lamps may differ from one company to another, but in general, each lamp is broken down into component parts that can be individually recycled. Mercury is extracted from recyclable components and its vapours are confined throughout the recycling process. This procedure allows for 98% of the materials that make up mercury lamps to be recycled.

The process used by FLR offers an example of how mercury lamps are recycled.[27] This recycler receives used lamps in cardboard packaging. The lamps are crushed in a closed environment able to contain mercury vapour. The resultant mix is then separated into four waste streams: aluminum and brass, glass, mercury and phosphorous powder.

The glass is cleaned, tested for mercury content and sent for recycling. The phosphorous powder is chemically separated and scrubbed in a closed humidity-based system. This separation system also concentrates mercury components. The mercury is then recovered for reuse in the manufacture of lamps or other consumer products. The phosphorous powder is recycled and used in paint pigments or in the plastics industry. Only a small amount of Bakelite insulator representing about 2% of total lamp weight is not recycled. Uncontaminated by mercury, the Bakelite is shipped along with the metal residue to a recycling foundry, where it is incinerated in the recycling process.

[27] M. Johnston, *Fluorescent Lamp Recycling*, Recycling Technology Newsletter at CANMET-MMSL, October 1999, Natural Resources Canada http://nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/rnet/consartf.htm

Based on 2004 Canadian figures, estimates for amounts of materials recovered and recycled from mercury lamps in Québec are shown in Table 3.[28]

Table 3. Weight and percentage of materials recycled from mercury lamps in Québec

Material	Recovered weight (kg)	Percentage (%)
Glass	272,877	93
Phosphorous powder	9,082	3.1
Mercury	47	0.02
Combined metals	10,427	3.6
Total weight	292,433	100

It is interesting to note that if 100% of discarded mercury lamps had been recycled, mercury lamps recyclers would have, according to these figures, recycled more than 650 kg of mercury. Furthermore, the recyclers have indicated that all recycled mercury was resold for use in the manufacture of new lamps or other mercury-containing products.

5.4 Recycling costs

Fees required by recyclers in Québec are subject to negotiations between the parties. However, in January 2007, fees quoted by one recycler amounted to $0.13 per linear foot for fluorescent tubes, $0.25 per CFL unit and $1.50–$2.50 per unit for HID lamps. In its 2005 environmental management report,[29] l'Université du Québec à Rimouski (UQAR) indicated that the cost of recycling its fluorescent tubes was $0.56 per 48" tube or $0.14 per foot and that this was about half of the original purchase cost.

These amounts are comparable to U.S. fees. For example, one of the mercury lamp recycling awareness tools produced for the Northeast Waste Management Officials' Association (NEWMAO) indicates that the average recycling cost for a four-foot tube varies between $0.25 and $0.40 U.S., which represents between 406 and 625 U.S. dollars in fluorescent tube recycling costs per 100,000 square feet of building space.

Before being recycled, fluorescent tubes must be transported to a recycling centre. Transportation costs may vary according to distance and are in general high due to the

[28] C. Hilkene & K. Friesen, 2005. *Background study on increasing recycling of end-of-life mercury-containing lamps from residential and commercial sources in Canada*, Pollution Probe http://www.pollutionprobe.org/Reports/merclampsreport.pdf

[29] UQAR, 2006. *La gestion environnementale à l'UQAR*, Rapport annuel 2005 http://www.uqar.uquebec.ca/uqar-info/documents/Bilan_envir_2005.pdf

fragility and volume of fluorescent lamps. For example, UQAR estimated that it paid $750 in transportation charges for shipping 1,185 48" fluorescent tubes weighing approximately 370 kg from Rimouski to the Montréal region.

Furthermore, fluorescent tube crushing machines exist that can reduce the volume of used tubes and associated costs of warehousing and recycling. These crushers are typically made of a 55-gallon barrel in which a device is installed that crushes the lamps and recovers the mercury vapour in active carbon filters. This equipment can contain more than 1,000 48" crushed fluorescent tubes instead of the 40–50 intact tubes that would occupy the same volume. No permit is required in Québec for transporting these kinds of crushed tubes to recycling sites. However, users of crushers need to apply for a certificate of authorization pursuant to Section 22 of the Environmental Quality Act. A 2006 United States EPA report[30] indicated that this kind of equipment releases varying amounts of mercury into the air and needs to be improved to ensure that emissions do not affect the health of workers. Furthermore, the EPA did not rule either favourably or unfavourably with respect to their use. In Québec, some of these machines are in use already or in the process of installation, and recyclers accept crushed fluorescent lamps. It needs to be said, however, that according to tests carried out by the MDDEP, these kinds of crushed fluorescent lamps show the characteristics of hazardous matter. Consequently, carriers of crushed fluorescent bulbs to authorized hazmat disposal sites must hold a permit under Section 117 of the Regulation on hazardous materials.

5.5 Municipal mercury lamp recovery programs in Canada

The Pollution Probe study included a survey of mercury lamp recovery and recycling initiatives taken by Canadian municipalities. Even though no Québec municipality participated in this 2004 survey, the data and subsequent conclusions seem pertinent to the Québec context. Account needs to be taken, though, of the fact that subsequent to 2004, almost all municipalities in Québec adopted a residual materials management plan and that HHW management procedures may have changed after this date. It should be remembered that municipal residual materials management plans must allow for meeting a HHW recovery goal of 75% by 2008.

Of the 40 Canadian municipalities that responded to the questionnaire, 25 had a program for recovering fluorescent lamps at source and one was to begin a similar program in 2005. Depots for used fluorescent lamps were present in 32 of these municipalities. A number of municipalities indicated that the recovered fluorescent lamps were sent for disposal. However, 7 municipalities indicated that the recovery program led to reuse or recycling. Together, these 7 municipalities recovered a total of 191,000 fluorescent lamps. None of the municipalities that recovered residential fluorescent lamps for recycling charged fees. However, one municipality indicated that it charged for recycling lamps from the business

[30] United States Environmental Protection Agency, 2006. *Mercury lamp crusher study*. Office of Solid Waste and Emergency Response, Washington DC http://www.epa.gov/epaoswer/hazwaste/id/univwast/drumtop/drum-top.pdf

sector. Without being very clear on the costs related to their fluorescent lamps recovery programs municipalities did mention the following:

- From $210–$9,000 for collection
- From $50–$500 for promotion and awareness
- From $50–$500 for program coordination

Municipalities additionally indicated that their recovery programs did not achieve the hoped-for rate of participation. A lack of public understanding of the harmful effects of mercury lamp disposal in landfills or by incineration was mentioned as the most important factor. Other problems such as shipping, handling and storage, excessive costs, size of territory and lack of personnel training were also mentioned.

5.6 Lowering greenhouse gas through fluorescent lamp recycling

In its study, Pollution Probe also made provisional estimates of reductions in greenhouse gas emissions that would be obtained by recycling materials contained in used fluorescent lamps compared to obtaining these same materials from raw materials. By supposing that these reductions are proportional to population, it is possible to calculate that Québec would lower greenhouse gas emissions by 41 tons annually, based on the 2004-recycling rate of 7%. If the rate of recycling reaches 24%, the current U.S. figure, these reductions would rise to 140 tons. If the rate rose to 80%, which is the target rate for Europe in 2006 and for the United States in 2009, 466 tons of greenhouse gas emissions would be avoided. Finally, a 100% recycling rate would save 543 tons of greenhouse gas emissions. Reductions of this size are small compared to Québec's 2012 greenhouse gas reduction goal of 10 megatons to which 3.8 megatons will be added through the participation of the federal government.

6-THE PROPOSED QUÉBEC REGULATION

The means selected for the EPR mercury lamp regulation is to include a mercury lamp-specific appendix in the draft EPR framework regulation that is currently in preparation. This section describes the specific way that mercury lamps will be covered in this appendix, including the list of target products, recovery and recycling objectives to be set, envisaged collection procedures and implementation delays.

6.1 Target products

All mercury lamps sold in Québec will be targeted. The following list includes the main categories of mercury lamps generally mentioned by manufacturers. The regulation does not exclude any type of mercury lamp not enumerated in this list.

- Fluorescent tubes
- Compact Fluorescent Lamps (CFL)

- High intensity discharge (HID) lamps that employ metallic halides, metallo-ceramic halides, high-pressure sodium and mercury vapour
- Specialized mercury lamps
- Short arc mercury lamps
- Capillary lamps

6.2 Objectives

Industry-implemented recovery system performance objectives will be set out in the appendix and established by taking account of the fact that all mercury lamps sold are recoverable, component materials are almost completely recyclable, they are discarded whole and are not subject to reuse. Recovery rates will be set according to number of units recovered or equivalent weight compared to quantities sold for a reference year, representative of expected average product life span. Producers will be required to supply detailed, per category. product life spans and corresponding sales figures to the satisfaction of the minister. Should this information not be submitted early enough for use in the calculation of objectives achievement, or if it is unsatisfactory, average sales figures for the three preceding years will be used instead. Objectives thresholds will take account of mercury lamp recovery and reclamation objectives set in voluntary or regulatory programs elsewhere in the world. (Table 3)

Table 3. Rate of recovery of mercury lamps set in various programs

Location	Program	Implemented	Objectives	Results
USA	Voluntary (Industry)	1990	80% (2009)	24% (2004)
France	Mandatory EPR	2006	80%	18% (6 months) 38% (1 year)
Alberta	Voluntary (Industry)	2001	75%	23% (1 year)
Taiwan	Mandatory EPR	2002	n. d.	87% (2003)

The appendix will stipulate recovery thresholds to be reached at two and at five years from the start of program implementation. Thresholds will be specific for compact fluorescent lamps, fluorescent tubes and other types of mercury lamps. It is envisaged that subsequently, thresholds may be revised and complementary performance indicators, for example recovered mercury by weight, may be established by government decision following consultations with producers. Until new indicators are defined and new objectives set, recovery levels to be attained will remain those set for the fifth year of the program.

6.3 Service levels

In the EPR perspective, producers retain freedom of choice as to means employed. However, it is possible that the means of fluorescent lamp collection offered to ICI sector clients might differ from those available to clients in the residential sector. For example, in the ICI sector, existing or emerging channels involving distributors, lamp maintenance and installation entrepreneurs and recyclers might be preferred. However, in either case, the appendix will spell out the minimum service or collection site features to be made available to generators, by products. While leaving some latitude to producers, the requirements will be set in a manner so as to ensure that collection services are adequate for need throughout Québec.

6.4 Implementation delays

Dispositions relative to the implementation of an EPR approach in Québec allow producers to set up individual recovery and reclamation programs or join an organization that has been accredited by RECYC-QUÉBEC for implementing and managing a collective program on behalf of its members. In order to give producers the time needed to choose between the two options and prepare their programs, a delay of approximately one year has been proposed between the adoption of the appendix and program implementation. Moreover, the appendix may allow for producers to gradually provide the required services and total number of collection sites, as needed.

7 CONCLUSION

Due to the fact that they use much less energy than incandescent lamps, mercury lamps and more particularly CFLs are more and more popular all over the world. Moreover, as a number of countries including Canada will ban most incandescent lamps, compact fluorescent lamps are the only viable short-term and medium-term alternatives.

In Québec, it is already expected that the volume of discarded CFLs will multiply by a factor of 10 within 5 years. However, residential sector mercury lamp recovery and recycling programs are currently not well developed and will be unable to achieve satisfactory performance. Since these lamps contain mercury, it is important that efficient recovery and recycling programs be quickly implemented to handle the numbers of used CFLs discarded by Québec households in the coming years.

Moreover, choosing EPR for mercury lamps in Québec follows the international trend that aims to make producers responsible for the products they sell that have reached their end of useful life. This approach was already selected as a principle in the Québec Residual Materials Management Policy 1998-2008 action plan. Current regulations aimed at managing oils and paints according to EPR were the first to be adopted.

It is thus justified to prepare an appendix aimed at the recovery and processing of mercury

lamps in the draft EPR framework regulation. In this way, release of contaminants into the environment will be diminished, use of resources will be optimized and achieving the objectives of the Québec Residual Materials Management Policy 1998-2008 will be supporte.

Extended producer responsibility (EPR)

Current status, challenges and perspectives

Part VII
Consumer batteries

March 2008

Développement durable,
Environnement
et Parcs
Québec

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INTRODUCTION

Consumers are more and more interested in products that they can carry with them and use whenever they want. This attraction has led to the growth in sales of both wireless products and the batteries required for their operation. Whether they are rechargeable or non-rechargeable, these batteries have a limited life span and in the end, form part of residual materials that are generated within any particular territory.

Since they may contain toxic metals or have corrosive or reactive properties, used batteries are in fact hazardous household waste (HHW). Moreover, significant proportions of their component materials are recyclable. In this sense, recovery and recycling batteries can simultaneously prevent hazardous substances from being released into the environment and avoid wasting resources.

The Extended Producer Responsibility (EPR) approach to this problem was recommended in the Québec Residual Materials Management Policy 1998-2008 in order to ensure the implementation of HHW recovery and reclamation programs. Consequently, it is proposed to include consumer batteries as part of a draft framework EPR regulation. This report describes environmental issues related to rechargeable and non-rechargeable batteries that have reached their end of useful life. Additionally, it offers examples of regulatory tools adopted by other governments and provides a picture of the presence of batteries in Québec that includes quantities in use, the means for disposing of them and recovery and reclamation rates and methods.

1 DESCRIPTION OF CONSUMER BATTERIES

Batteries are sources of electrical energy obtained through the direct transformation of chemical energy. The chemical reaction requires an anode, usually composed of a metallic oxide such as manganese oxide, and a metal cathode such as zinc, cadmium or nickel. A saline or alkaline solution allows electrical current to pass between the anode and the cathode.

Consumer or household batteries are portable batteries generally weighing less than 1 kg. Industrial or automobile batteries that generally weigh more than 1 kg are not included in the category of consumer batteries. There are two major categories of consumer batteries: non-rechargeable or "primary" batteries, and rechargeable or "secondary" batteries. Batteries are usually identified by the elements in them that are responsible for the chemical reaction that provides usable energy.

1.1 Primary consumer batteries

Most primary consumer batteries are either cylindrical or button shaped. The most common cylindrical batteries on the market are alkaline batteries, followed by carbon-zinc and primary lithium batteries. Demand for the latter is, moreover, on the rise.

Alkaline batteries have the longest lives and are regularly used in toys, radios, flashlights and clocks. Carbon-zinc batteries are essentially the same as alkaline batteries as to usage but are less expensive and do not last as long. Primary lithium batteries, which offer a greater energy flow than other types, are frequently used in cameras, watches and games.

Figure 1. Alkaline battery

Button batteries are the smallest type of battery sold to consumers. These are the only batteries for which most industrialized countries do not prohibit the presence of mercury, although the amounts of mercury authorized are marginal (for example, in the United States, this number must not exceed 25 mg). The most popular of these batteries, used for the most part in hearing aids, watches, toys and calculators are the zinc-air and silver oxide varieties.

Figure 2. Button battery

1.2 Secondary consumer batteries

Secondary batteries are used for more energy-demanding applications and include nickel-cadmium, metallic nickel hydride, lithium-ion and lithium polymer batteries as well as small, sealed lead acid (SLA) batteries.

Nickel-cadmium batteries made up the largest market segment for secondary batteries at the beginning of the decade. They are, however, gradually being replaced by cadmium-free batteries. NiCad batteries are suitable for devices that require a lot of energy and frequent recharging such as portable power tools, portable vacuum cleaners and portable telephones.

Figure 3. Nickel-cadmium batteries

Metallic nickel hydride batteries are more durable than the nickel-cadmium variety. They are used in cellular telephones and video cameras and as rechargeable substitutes for alkaline batteries in some applications.

Figure 4. Metallic nickel hydride batteries

Lithium-ion batteries are lighter and contain more energy than nickel-cadmium or metallic nickel hydride batteries. They are commonly used in cellular telephones, portable computers and video cameras.

Figure 5 Lithium-ion battery

Lithium polymer batteries are a little lighter in weight than lithium-ion batteries and while used in cellular telephones, are unable to provide the energy spikes needed by electronic products such as portable computers.

Figure 6. Lithium polymer battery

Sealed lead-acid (SLA) batteries are usually employed in providing electricity for industrial products, emergency lighting and alarm systems. They are also found in devices requiring Uninterruptible Power Supply (UPS) for stable electrical supply free of outages or micro-outages, and in starter, lighting and ignition systems. SLA has a small role in some segments of the consumer battery market including electric lawn-mowers and wheel-chairs, toys, portable power tools, UPS and a number of telecommunication applications.

Figure 7. Sealed lead-acid (SLA) battery

2 CONSUMER BATTERY- RELATED ENVIRONMENTAL ISSUES

Consumer batteries all contain metals, some of which, cadmium, nickel, lead and mercury, are considered to be toxic substances under the 1999 Canadian Environmental Protection Act (CEPA).

2.1 Cadmium toxicity

Cadmium accumulates mainly in our kidneys, but the relationship between cadmium and renal cancer has not yet been clearly established. Still, studies on the carcinogenic effect of cadmium on the lungs has led to cadmium salts being classified as “probable” or “possible” human carcinogenic agents. From an environmental perspective, cadmium is known to be a toxic substance in land and water milieus.

2.2 Nickel toxicity

Chronic exposure to nickel, especially in the workplace, is a risk factor for lung cancer. Cutaneous exposure may result in hypersensitivity-related lesions. Nickel is equally harmful to aquatic and plant life. Under CEPA, nickel constitutes a toxic substance when present in inorganic oxygen, sulphur or soluble nickel compounds. In its pure metallic state, nickel is not deemed toxic.

2.3 Lead toxicity

Saturnism is the word used to designate the various manifestations of lead poisoning. Lead colic is probably the most known of the metal’s toxic effects, but lead also causes

neurological behavioural dysfunction and deterioration of the intellect. Lead may also cause a drop in red blood cell count with resulting anaemia. The administration of heavy doses of lead has led to renal cancer in small rodents. However there is no proof of increased cancer-related deaths in populations that have been exposed to lead. Lead poisoning is normally related to chronic exposure, and acute lead poisoning is rare.

2.4 Mercury toxicity

Mercury poisoning, also known as hydrargyria or hydrargyrism, is characterized by lesions in the central nervous system and by symptoms of trembling, speech difficulty and psychological problems. Deadly mercury poisoning is possible in some circumstances.

In a natural aquatic environment, mercury is transformed into methylmercury, which is accumulated by organisms that consume it over their lifetimes. Additionally, through bioamplification, its level of concentration increases as it rises through the food chain hierarchy, starting with microorganisms and on through fish and to predators at the top of the food chain, including man. High levels of methylmercury can lead to a decline in affected animal species populations and can be harmful to human health.

2.5 Other harmful substances

In addition to the above-mentioned metals, iron, silver and zinc, chemical elements that found in batteries, are included in Canadian and Québec soil and water quality regulations. Additionally, due to the corrosive or reactive nature of sodium and lithium hydroxides they contain, consumer batteries may display characteristics of hazardous materials as defined by the regulations.

3 GOVERNMENTAL INTERVENTION RELATIVE TO CONSUMER BATTERY MANAGEMENT

This section presents a non-exhaustive picture of how governments around the world have intervened with respect to the management of consumer batteries. A number of states and countries from the United States, Europe, Asia and Canada were selected as representative of the range of management procedures that extend from voluntary programs that foster recovery and recycling to laws that mandate objectives.

3.1 United States

In 1995, the United States Environmental Protection Agency (EPA) concluded that nickel-cadmium batteries accounted for 75% of the cadmium in American landfills while SLAs accounted for 65% of lead in these sites.[1] To avoid releasing these toxic substances into the

[1] United States Environmental Protection Agency, 2002. *The "Battery Act" Law creates public health, environmental safeguards through phase-out of mercury batteries and other important requirements.* Enforcement Alert, Office of Regulatory Enforcement, Vol. 5(2), 2002 http://www.epa.gov/compliance/resources/newsletters/civil/enfalert/battery.pdf

environment and to cap the presence of mercury on its territory, the government of the United States passed the 1996 *Mercury-Containing and Rechargeable Battery Management Act* (better known as the *Battery Act*). The aim of this law was to complete the process of eliminating mercury in batteries that had been initiated by industry and offer consumers an efficient and low-cost means for recovering and adequately disposing of used nickel-cadmium and SLA batteries.

The *Battery Act* prohibited the sale of manganese and carbon-zinc alkaline batteries containing intentionally-introduced mercury, and restricted mercury content in manganese alkaline button batteries to a maximum of 25 mg. The Act also prohibited the sale of mercury oxide button batteries and set conditions on the sale of other mercury oxide batteries.

Additionally, the 1996 *Battery Act* prescribed uniform national labelling norms for nickel-cadmium batteries and other regulated batteries to foster collection and recycling. The EPA also passed the May 1995 *Universal Waste Rule*,[2] which targeted harmful hazardous waste including nickel-cadmium and SLA batteries present in municipal waste and encouraged appropriate recycling and management measures. The *Universal Waste Rule* rationalized a number of requirements of the *Resources Conservation and Recovery Act (RCRA)*[3] with respect to the collection, storage and transport of certain designated hazardous waste in order to facilitate its recovery and recycling. During the period preceding the passage of the *Battery Act*, the nickel-cadmium industry set up the Rechargeable Battery Recycling Corporation (RBRC) in 1994 and tasked it with implementing a volunteer battery collection program. The RBRC began its volunteer nickel-cadmium and SLA battery collection program in the United States in 1995.

In addition to the federal law, many state governments also passed measures aimed at the management of consumer batteries. For example, California prohibited the disposal of batteries in landfills or by incineration and made recycling mandatory for both individuals and corporations. Connecticut, for its part, legislated municipal nickel-cadmium battery recycling and button battery recovery. Municipalities also passed measures concerning batteries. New York promulgated a regulation requiring stores to accept rechargeable batteries returned for recycling. Few estimates exist concerning U.S. state battery recycling figures. Florida claims that 13% of nickel-cadmium batteries representing more than three-fourths of recovered batteries were recycled in 2000 thanks mainly to the RBRC, and estimated that the figure had risen to 20–30% by 2004.[4]

3.2 Europe

In Europe, management of batteries was handled until 2006 by the European Union through a series of directives, and more particularly through Council Directive 91/157/EEC on batteries

[2] U. S. Environmental Protection Agency. *Universal waste - Batteries* http://www.epa.gov/epaoswer/hazwaste/id/univwast/battery.htm

[3] U.S. Code Home. *Title 42 – The public health and welfare – Chapter 82 – Solid waste disposal* http://www.access.gpo.gov/uscode/title42/chapter82_.html http://www.ec.gc.ca/nopp/docs/rpt/battery/fr/toc.cfm

[4] RIS International Ltd. *Canadian Consumer Battery Baseline Study - Final Report to* Environment Canada, February 2007 http://www.ec.gc.ca/nopp/docs/rpt/battery/en/toc.cfm

and accumulators containing certain hazardous substances, adopted in March 1991 and subsequently modified.[5] These directives sought to establish adequate measures for the recovery, processing and disposal of used batteries and to limit the sale of designated batteries throughout the European Union. Directive 91/157/EEC was abrogated in September 2006 through Directive 2006/66/CE.[6] This new directive, based on the principle of Extended Producer Responsibility, prohibits the sale of batteries and accumulators that contain more than 0.0005% of mercury by weight and 0.002% by weight of cadmium, except for certain types of batteries and certain batteries intended for specific purposes. Additionally, the directive set collection objectives of at least 25% by 2012 and at least 45% by 2016, and recycling rates of at least 65% of average weight for lead-acid batteries and accumulators, at least 75% of average weight for nickel-cadmium batteries and accumulators and at least 50% of average weight for other waste batteries and accumulators by 2010. The European directive concerning electrical and electronic material waste[7] that stipulates measures aimed at preventing the formation of electrical and electronic waste, sets requirements with respect to their recycling and other forms of reclamation and also contains requirements that directly concern batteries, notably at the time of device dismantling. Certain dispositions of the *Restriction of Hazardous Substances*[8] directive that curtails the use of certain toxic substances such as mercury and cadmium in electrical and electronic equipment sold in Europe, also apply to consumer batteries.

Directive 91/157/EEC required member states to prepare four-year programs aimed at gradually reducing used household batteries sent for disposal, in collaboration with industry. Among European countries that have already implemented national programs, Belgium, Denmark, The Netherlands, Norway and Switzerland have primary and secondary battery recovery objectives of 75% and more. Program results may vary. For example, Switzerland's program achieved a collection and recycling rate for batteries and accumulators of 66.4% (2,460 tons) in 2006[9] while in Belgium, the rate was 50% (2,466 tons) in 2005.[10] The

[5] For the purposes of Directive n° 2006/66/CE, "battery" or "accumulator" means any source of electrical energy generated by direct conversion of chemical energy and consisting of one or more primary battery cells (nonrechargeable) or consisting of one or more secondary battery cells (rechargeable). In North America, the term "accumulator" is not commonly used. The term "battery" incorporates "accumulator."

[6] Directive 2006/66/CE 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, Acting in accordance with the procedure laid down in Article 251 of the Treaty (4), in the light of the joint text approved by the Conciliation Committee 29.9.2006. *Official Journal of the European Union*, L266/1 http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_266/l_26620060926en00010014.pdf

[7] European Directive 2002/96/CE of the European Parliament and Council of January 27, 2003 on Waste electrical and electronic equipment (WEEE). *Official Journal of the European Union*, 13.2.2003 L37/24 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:037:0024:0038:EN:PDF

[8] European Directive 2002/95/CE of the European Parliament and Council of January 27, on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment. *Official Journal of the European Union*, 13.2.2003 L37/19
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:037:0019:0023:EN:PDF

[9] INOBAT Organisation d'intérêt pour l'élimination des piles. *Deux tiers des batteries sont recyclés*, Press release, February 28, 2007 http://www.inobat.ch/fileadmin/user_upload/pdf/MM_Quote2006_fr.pdf

[10] BEBAT, General Information http://www.bebat.be/pages/en/main.html

populations of both countries (around 7.5 million for Switzerland and 10.5 million for Belgium in 2006) are similar in size to that of Québec.

3.3 Asia

Japan adopted two legislative measures for rechargeable battery management including a strict labelling regime and a 2001 law that requires all manufacturers and importers of rechargeable batteries and equipment utilising rechargeable batteries to install systems for collecting and recycling batteries. The following objectives were established for battery recycling: 60% for nickel-cadmium batteries, 55% for metallic nickel-hydride (NiMH) batteries, 30% for lithion-ion (Li-ion) batteries and 50% for SLAs.

The Battery Association of Japan (BAJ) established a centre for promoting the recycling of rechargeable batteries that encourages collection and recycling. Consumers can return used rechargeable batteries to nearly 30,000 collection sites throughout Japan, at no cost to themselves. Industry is responsible for the costs of collection and recycling. In 2000, the BAJ indicated that the nickel-cadmium battery recycling rate was greater than 40%[11].

A legislative measure adopted in Taiwan merits mention since it concerns products that may be sold in Québec. That measure prohibited, as of September 2006, the manufacture, importing and sale of manganese-zinc and alkaline batteries that contain in excess of 5 ppm (0.0005%) of mercury, except for button batteries.

3.4 Canada and Canadian provinces

In Canada, exporting, importing and transporting used batteries is subject to federal hazardous waste legislation and regulation including the Transportation of Dangerous Goods Act and the Export and Import of Hazardous Waste Regulations that require the preparation of manifests and impose adequate shipping and handling measures for hazardous goods and waste. Additionally, labelling on batteries sold in Canada must conform to International Electrotechnical Commission norms applicable to the appropriate battery model, as required.

Moreover, contrary to the United States or Europe, Canada has not set restrictions on the contents of batteries sold within its territory, but it does take advantage of U.S. laws. As a direct consequence of the 1996 United States *Battery Act*, Canadian production of mercury oxide batteries ceased in January 1996 and battery manufacturers voluntarily eliminated mercury from all alkaline, carbon-zinc and zinc chloride batteries. Small amounts of mercury (< 25mg per unit) are still used in button batteries. However, counterfeit batteries sold in Canada do exceed mercury limits despite packaging information. Canada also benefits from the voluntary nickel-cadmium and other secondary battery collection program implemented in all Canadian provinces in 1997 by the Rechargeable Battery Recycling Corporation (RBRC).

On December 11, 2006, Ontario designated municipal hazardous and special waste (MHSW)

[11] Battery Association of Japan http://www.baj.or.jp/e/index.html

as residual materials requiring a program of diversion under the Waste Diversion Act that is financed by fees paid by industry. Ontario has stipulated a number of phases for the completion of this program, with each phase targeting a specific list of products. Phase 1 includes primary batteries and Phase 2, secondary batteries. The first phase of the program was received by The Ministry of the Environment of Ontario on May 23, 2007 and was the subject of a 30-day public hearing that began on June 11, 2007. No confirmation of program approval or date of implementation has yet been announced.

For its part, the British Columbia *Recycling Regulation* added primary and secondary batteries to its updated list of regulated product categories on June 26, 2006. This regulation requires industry to implement a recovery and recycling program for designated products.

Table 1 summarizes regulations in Canadian provinces that have designated or shown intent to designate consumer batteries among products for which implementation of post-consumption recovery and recycling programs funded by producers is mandatory. These provinces have opted for a product designation mechanism either through a framework regulation (British Columbia and Manitoba) or a framework law (Ontario).

Table 1. Legislative measures aimed at consumer battery recovery and recycling in Canadian provinces

Province	Law, regulation or draft regulation	Mechanism for product designation	Current state of designation	Follow-up
British Columbia	*Environmental Management Act* (2004-10-07) *Recycling Regulation*	EPR framework regulation Product designation through regulatory amendment	Primary and secondary batteries identified from a list of nine products that may be designated	Two products selected as priorities from a list of nine products submitted for a public consultation in the fall of 2007
Manitoba	*Waste Reduction and Prevention Act* *Proposed Hazardous or Prescribed Household Material Stewardship Regulation*, (2007-06-25)	EPR draft framework regulation Regulatory amendment required for designating new products Final date for comments on designated products: 13/11/2007	Batteries specifically not designated: hazardous household waste designated	N.A.
Ontario	Waste Diversion Act (2002-06)	Allows ministerial government agency product designation without amending the act.	11/12/2006: Phase 1 designation of primary batteries Phase 2: secondary batteries	Phase 1: program subject to public consultation until July 11, 2007 Phase 2: date of program submission to be set after Phase 1 approval.

Various Canadian municipal or regional administrations have also implemented programs for battery collection and prohibition of battery disposal. For example, Greater Vancouver has prohibited the disposal of nickel-cadmium batteries. Disposal of HHW in general has been prohibited by the city of Owen Sound in Ontario and by the Central Okanagan and Greater Vancouver regional districts in British Columbia. Inasmuch as rechargeable batteries are mostly found in electronic and electrical equipment, the prohibition of disposing of such equipment promulgated by Owen Sound, Calgary and Greater Vancouver also includes batteries. The same holds for electronic and electrical equipment waste recovery and recycling programs implemented by local communities.

A majority of Canadian municipalities offer HHW collection programs that let residents drop off their primary and secondary batteries free of charge so they may be appropriately managed.

Prince Edward Island's *Re-Store Your Batteries* program targets primary batteries only. Begun in July 2005, this program lets consumers recycle their primary batteries by dropping them off at participating grocery stores. Consumers can drop off primary cylindrical batteries (D, C, AA, AAA, 9 volts, 12 volts, etc.) and button batteries, free of cost. The batteries are then shipped off island for dismantling and recycling.

Regulatory and non-regulatory initiatives developed by Canadian provinces with respect to electronic and electrical equipment waste also impact consumer batteries and are described in the section covering extended producer responsibility for electronic products.

3.5 Intergovernmental agreements

Heavy metals are the subject of specific agreements between countries aimed at curtailing their presence in the environment. These agreements are often the source of specific intervention with respect to the management of products such as consumer batteries that contain mercury, cadmium or lead. Three agreements deserve mention here: two signed by the Government of Canada and the United Nations, and the third between Québec and its partners of the Conference of the New England Governors and the Eastern Canadian Premiers.

In 1998, Canada ratified the Protocol to the United Nations Economic Commission for Europe (ECE) Convention on Long Range Transboundary Air Pollution (LRTAP) with respect to heavy metals that came into effect in December 2003. The Protocol seeks to curtail emissions from industrial sources and from waste combustion and incineration, and introduces measures for reducing mercury emissions from products such as dry batteries.

Previously, in August 1992, Canada also ratified the Basel Convention on the control of transboundary movements of hazardous wastes and their disposal, which prohibits shipping hazardous waste and recyclables across international borders without prior notice and approval.

For its part, Québec is signatory to the resolution concerning mercury and its effects on the

environment that was adopted in 1998 by the Conference of the New England Governors and the Eastern Canadian Premiers (NEG-ECP). Under this agreement, Québec participates in the implementation of a regional action plan and is currently preparing a Québec action plan aimed at curtailing the amount of mercury released into the environment more particularly, regulating consumer products containing mercury, such as batteries.

4 QUÉBEC MANAGEMENT OF CONSUMER BATTERIES THAT HAVE REACHED THEIR END OF USEFUL LIFE

This section summarizes much of the information found in a February 2007 study[12] made for Environment Canada by RIS International Ltd. Since Canadian and Québec consumer habits are considered similar, figures from this study have been transposed into a Québec context, as needed, taking account of the relative population of the province compared to Canada. According to Statistics Canada demographic data,[13] the population of Québéc will constitute on average 23.5% of Canada during the first decade of the twenty-first century.

4.1 Used consumer battery management programs in Québec

Contrary to the situation as it applies to fluorescent lights, the management of consumer batteries that have reached their end of useful life presents no particular issue for industrial, commercial or institutional (ICI) players. A number of certification programs such as BOMA of Canada's (The Building Owners and Managers Association – of which La Société immobilière du Québec – SIQ is a member) Go Green require members to recover HHW but do not specifically mention consumer batteries. Hydro-Québec has also implemented a province-wide program for managing HHW that does seek to recover batteries. On the whole, ICI players that have set up environmental management systems have included end of useful life HHW management. Moreover, a number of Québec programs for electronic products overlap onto the management of batteries contained in these products.

Additionally, consideration must be given to the Rechargeable Battery Recycling Corporation (RBRC) whose program is universal and gives across-the-board coverage to used secondary batteries in Québec, whether they originate in the ICI or residential sectors. However, there is no similar universal Québec program that targets the recovery and recycling of primary batteries except for HHW collection systems run by municipalities, such as curbside collection on set days, mobile units and permanent drop-off depots.

4.2 Sales of consumer batteries in Québec

Using RIS International Ltd estimates (transposed for Québec) of the number of consumer batteries sold in Canada between 2001 and 2010, it is clear that total primary batteries sales will increase from 86 million units to 146 million units. This 70% increase stems essentially

[12]. RIS International Ltd. *Canadian Consumer Battery Baseline Study - Final Report to* Environment Canada, February 2007 http://www.ec.gc.ca/nopp/docs/rpt/battery/en/toc.cfm
[13] Statistics Canada. *Population by year, by province and territory* http://www40.statcan.ca/l01/cst01/demo02a.htm

from the sales of alkaline batteries, which will increase by 85% over the same period of time. Alkaline batteries that accounted for 70% of the primary battery market in 2001 will hold a 76% share by 2010. However, except for silver oxide batteries, all other primary battery sales will see increased unit sales during this period. If these sales are expressed in terms of individuals, it can be estimated that while in 2001 there were around 11 primary batteries sold in Québec per person, that number will rise to nearly 18 if current demographic and consumption trends hold.

The progression in 2001–2010 sales of secondary batteries will be even greater than for primary batteries, rising by 164% from 3.4 million units to 9.1 million units. According to the reference study, the market will be dominated by the nickel-cadmium type of battery, whose secondary battery market share however will decline from 68% in 2001 to around 58% by 2010. Future sales of nickel-cadmium batteries seem to be clearly overestimated by RIS International, since industry has already begun to gradually switch to marketing cadmium-free rechargeable batteries that are less harmful to the environment. By 2006, nickel-cadmium battery sales had already dropped in the industrialized countries; figures released in Japan[14] show a 62% rechargeable battery market share going to lithium-ion batteries compared to a 20% share for Ni-Cd batteries. SLA (sealed lead-acid) battery sales have begun to decline too, and this trend will continue in the future, leading to less lead being released into the environment by secondary consumer batteries.

Overall, nearly 106 million consumer batteries were sold in Québec in 2004; of these, 95.6% were primary non-rechargeable batteries and 4.4% secondary rechargeable batteries. In 2010, it is estimated that 155 million consumer batteries will be sold of which 94.1% will be primary batteries and 5.9%, secondary batteries.

4.3 Consumer battery manufacturers

The major manufacturers of primary batteries sold in North America, i.e. Duracell[MD] (Procter & Gamble), Energizer[MD] and Rayovac[MD] (Spectrum Brands) possess production facilities in Canada and the U.S.A. Secondary batteries are mostly produced in Asia, notably in Japan and to a growing extent, in China. For the Canadian market, these companies are part of the Canadian Household Battery Association (CHBA) that was created in 1993 to manage industry-related environmental issues.

4.4 Consumer battery recovery

The Répertoire québécois des récupérateurs, recycleurs and valorisateurs[15] contains more than 20 addresses of entreprises or ecocentres in various parts of the province where batteries may be recovered. In addition to these facilities, RBRC collection sites (addresses available

[14] Battery Association of Japan. *Secondary battery sales statistics by volume* http://www.baj.or.jp/e/statistics/index06.html

[15] RECYC-QUÉBEC. *Répertoire québécois des récupérateurs, recycleurs et valorisateurs* http://www.recyc-quebec.gouv.qc.ca/client/fr/repertoires/rep-recuperateurs.asp

on that organization's Website) increase the number of available collection points.[16] Finally, Mountain Equipment Co-op (MEC) recovers batteries sold in its own stores.[17]

4.5 Consumer battery recyclers

There is currently no specific consumer battery recycling facility in Québec. Batteries recovered in eastern Canada and in the eastern United States are, generally speaking, sent to one of three recyclers. Rechargeable batteries collected by RBRC are sent to the United States for metal recycling at International Metals Reclamation (INMETCO) in Pennsylvania. Two other companies possess similar facilities in Canada: International Marine Group in Colborne, Ontario and Toxco in Trail, B.C.

5 RECYCLING USED CONSUMER BATTERIES

This section deals with basic information such as components, annual discarded battery units and weights, rate of recycling, recycled materials, costs of recycling and consumer battery collection programs in Québec.

5.1 Consumer battery components

Consumer batteries are made of various materials including steel (16–60% of total weight), plastics and paper (0–30% of total weight), graphite, (0–13% of total weight), pure metals and metal oxides as well as saline or alkaline solutions. Zinc, which constitutes from 0–30% of batteries by weight, is the most important metallic component, followed by manganese dioxide (0–29% by weight). SLA battery lead content is in excess of 60%.

5.2 Generation of used consumer batteries in Québec

In order to estimate the average stream of used batteries based on unit sales and recycled battery weight in Canada as declared by RBRC and municipalities, RIS International built a mathematical model that takes into account total unit sales, average weight of batteries sold in Canada, their life span, how long consumers keep them before discarding them, as well as what happens to batteries as their end of useful life. The life span of primary batteries has been estimated to be three years depending on their chemical composition. Similar calculations for secondary batteries give a life span of from five to seven years. Additionally, the following hypotheses were used in the model:

- No consumer battery is reused once it has been discarded by the initial owner (Average total charge cycles have been taken into account with respect to the useful life of secondary batteries.)

[16] http://www.rbrc.org/cellarecycler/dropoff/index.php?PHPSESSID=02405e471a4e9e8c992b2509969ec38e
[17] Mountain Equipment Co-op. *Recyclage de batteries*
http://www.mec.ca/Main/content_text.jsp;jsessionid=F30LVCpPMHdj4Q23kGYThvgTJCrmT4BHz1v2hlvBN5VpLhprNLv9!488175022?FOLDER%3C%3Efolder_id=2534374302883391&CONTENT%3C%3Ecnt_id=10134198673220175&bmLocale=fr_CA&bmUID=1173845128877

- 30% of primary batteries are kept for 5 years and then discarded
- 60% of secondary batteries are kept 5 years and then discarded

RIS International then estimated the average weight of discarded batteries destined for recycling or disposal in Canada. By transposing these figures for Québec, it is calculated that total tonnage of primary and secondary batteries will have progressed from 1,964 tons in 2001 to 3,755 tons in 2010.

5.3 Rate of consumer battery recycling in Québec

In order to calculate the rate of consumer battery recycling in Canada in 2004, RIS International took a fixed recycling rate for primary batteries of 2% to reflect the low world figures for recycling of this type of battery. As for secondary batteries, recycled battery weights declared by RBRC were used to compile recycling rates by battery type. The resulting figures for the numbers and weights of batteries sold, discarded, recycled and disposed of as calculated for Canada have been transposed for Québec in Table 2. The table shows that of the 2,032 tons of primary batteries discarded in 2004, 40 tons or the equivalent of 2% by value, were recycled. This value might be a little greater for Québec due to the fact that entreprises specialized in HHW recovery have indicated to RECYC-QUÉBEC that in 2004, they shipped 74 tons of consumer batteries (in the majority primary batteries) to Ontario, for recycling.[18]

As for secondary batteries, out of 711 discarded tons, 35 tons or 4.9% were recycled in Québec. At 86% by weight, nickel-cadmium batteries represent the largest segment of recycled secondary batteries.

[18] RECYC-QUÉBEC. *Bilan 2004 de gestion des matières résiduelles in Québec, Fiche d'information I – batteries household* http://www.polymtl.ca/enviropoly/docs/documents/Fiche_info_piles_household.pdf

Table2. Estimated consumer batteries stream in Québec in 2004

		Sold		Discarded		Recycled		Disposed of	
	Kg/unit	Thousands of units	Tons	Thousands of units	Tons	Thousands of units (% of rejected)	Tons (% of rejected)	Thousands of units	Tons
Primary Batteries									
Carbon-zinc	0.027	19,161	517	17,182	464	344 (2%)	9.2 (2%)	16,838	455
Alkaline	0.028	73,051	2 045	55,211	1 546	1,104 (2%)	31 (2%)	54,107	1515
Zinc-air	0.033	10	0.24	6.8	0.24	0.14 (2%)	0.0005 (2%)	6.8	0.21
Lithium	0.016	1,428	23	980	16	20 (2%)	0.24 (2%)	960	15
Button (silver oxide)	0.001	2,518	3.1	2,224	2.6	44 (2%)	0.05 (2%)	2,179	2.6
Button (zinc-air)	0.001	5,437	5.0	3,852	3.5	77 (2%)	0.07 (2%)	3,775	3.3
Sub-total		101,603	2 594	79,455	2 032	1,589 (2%)	40 (2%)	77,866	1 991
Secondary Batteries									
Nickel-Cadmium	0.203	3,023	614	1,972	400	154 (7.8%)	31 (7.8%)	1,819	369
Nickel-metallic hydride	0.093	968	90	285	26	19 (6.7%)	1.7 (6.7%)	266	25
Lithium-ion	0.040	363	15	100	4.0	17 (17%)	0.7 (17%)	83	3.3
Lithium polymer	0.040	33	1,4	8.0	0.24	1.4 (18%)	0.05 (18%)	6.6	0.24
SLA	1.045	258	270	268	280	1.7 (0.7%)	1.9 (0.7%)	266	278
Sub-total		4,645	989	2,634	711	193 (7.3%)	35 (4.9%)	2,440	675
Total		106,248	3 583	82,089	2 743	1,782 (2.2%)	76 (2.8%)	80,307	2 666

Overall, the rate of primary and secondary battery recycling by weight was a little less than 3% in 2004. This value is less than the one reported by RECYC-QUÉBEC in its 2004 statement. The difference can be explained by the method used for calculation and by the considerable difference between the weight of secondary batteries sold in Québec in 2001 as reported by industry to RECYC-QUÉBEC, i.e. 63 tons or 4% by weight of all batteries sold, and the RIS International figure of 3,484 tons for Canada (822 tons transposed for Québec) or 28% by weight of all batteries sold. Taking into consideration the fact that the proportion of secondary batteries sold in 2001 according to RIS International Ltd corresponds to European 2002 figures,[19] the RIS International information sources appear the more reliable of the two and the rate of recycling as stated by them should be closer to reality.

Moreover, it can be concluded that nearly 95% of battery component materials will be disposed of at their end of useful life if the recycling rate remains at 2004 levels. If only toxic substances are counted, this would mean approximately 165 tons of lead, 110 kg of mercury, 85 tons of cadmium, 176 tons of nickel and 485 tons of zinc.

5.4 Recycling processes and materials

Many recycling methods exist, including hydrometallurgy and pyrometallurgical and thermal processing.

In hydrometallurgy, used batteries are pulverized and the resulting powder composed of manganese, zinc, potassium, graphite and mercury is mixed with a solution of sulphuric acid or soda. Through various filtering, grinding, exposure to an electrical field, electrolysis and carburising procedures, reusable products are recovered. A ton of used batteries that undergoes this procedure yields 130 kg of ferrous metals, 300–350 kg of zinc and 300–350 kg of manganese plus residual amounts of mercury.

For pyrometallurgical and thermal processing, used batteries are placed in an oven that separates the metals by condensation thanks to different individual evaporation rates and densities. Metals are recovered by scrubbing and by physicochemical processing. Pyrometallurgy will recover 150 kg of zinc, 350 kg of iron-manganese alloy and 40 kg of metal residues and residual mercury from one ton of used batteries through condensation and gas scrubbing.

5.5 Recovery and recycling costs

In Europe, the cost of battery and accumulator disposal was estimated to be € 120/ton in 2003, while the cost of collection, sorting and recycling of all portables batteries was estimated at between € 1,386/ton and € 1,846/ton[20] (Canadian dollar conversion value € 0.70,

[19] Commission des communautés européennes. Proposed 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, Bruxelles, 21.11.2003, COM(2003) 723 final: 2003/0282 (COD)
http://europa.eu/scadplus/leg/en/lvb/l21202.htm

[20] European Commission. 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. http://europa.eu/scadplus/leg/en/lvb/l21202.htm

2007-11-19).

In Canada, programs that collect municipal HHW are subject to widely varying costs and it is almost impossible to interpolate consumer battery recycling costs from total costs of HHW collection and recycling. However, the RBRC rechargeable battery collection and recycling program costs are better known. Some 300 battery manufacturers and/or brand owners that support this program pay a fee on each battery sold. In 2006, the fee schedule for non nickel-cadmium batteries had a $50,000 annual ceiling for each member and included the following fees:

- Single batteries, up to 1.5 volt: $0.0025 each;
- Small battery-packs, 1.5–8 volts: $0.01 each;
- Large battery-packs, 8.1 volts and greater: $0.02 each.

No fee ceiling was set for nickel-cadmium batteries.

Fees set for 2004 by three recycling companies that serve the eastern parts of Canada and the United States are shown in Table 3. On the whole, recycler fees for used batteries varied from less than $1 CAN/kg to more than $13/kg, according to battery type (historical conversion rate used was $1 U.S. = $1.33 CAN).

Table 3. Comparative pricing of three North American batteries recyclers (CAN $/kg)

	INMETCO	TOXCO	International Marine Group
NiMH batteries	0[1]	1.26	To be determined
NiCd batteries	1.39	1.26	1.65
Li-ion batteries	1.15	0.95	To be determined
Li batteries[2]	13.91	4.51–6.34[5]	8.82
Alkaline batteries	1.3	1.79	1.65
Zn-Cl batteries[4]	1.3	1.52	1.65
Zn-C batteries[4]	1.3	1.52	1.65
Zn-air batteries	1.17	1.52	1.76
HgO batteries button	14.33	7.78	12.12
AgO batteries button	11.46	0.73	0.55
Alkaline button batteries	11.46	7.78	N.A.
Zn-air button batteries[3]	N.A.	7.78	12.12
Li button batteries[2]	13.91	4.51–6.34	8.82

1: No charge for shipments of at least 2,000 batteries
2: This type of battery contains no mercury.
3: Mercury batteries containing zinc are not accepted.
4: Non-mercury batteries
5: Pricing depends on models and constituent compounds.

Moreover, as an indication, we may add that on its Website, Mountain Equipment Co-op states that it pays approximately $130 for recycling 30 kg of non-rechargeable batteries.[21]

5.6 Primary battery management according to the Environment Quality Act

Since mercury was prohibited in the manufacturing of cylindrical primary batteries, especially in Europe and in the United States, these batteries no longer contain metals that have been deemed toxic in various environmental regulations adopted around the world. Using this information as a starting point and relying on studies that show that the environmental risk associated with primary batteries is negligible, manufacturers of primary batteries and in particular of alkaline batteries, such as Duracell[MD], consider that used primary batteries do not constitute hazardous waste and should be treated the same as other non-hazardous household residual materials. [22]

[21] Mountain Equipment Co-op. *Battery recycling*
http://www.mec.ca/Main/content_text.jsp?CONTENT%3C%3Ecnt_id=10134198673220175&FOLDER%3C%3Efolder_id=2534374302883391&bmUID=1207997375822
[22] Duracell. The Company–*Position Statement: Management of Post-Consumer Primary Batteries: January, 2001*,http://www.professional.duracell.com/start.asp?section=the_company&page=environmental_info&print=

In Québec, the Environment Quality Act (EQA) recognizes hazardous materials by their properties (Paragraph 21, Section 1) as defined in Section 3 of the Regulation with respect to hazardous materials. Toxicity is one of these properties, but not the only one. Explosives, gases, flammable, radioactive, corrosive, combustible and leachable materials also have properties that define them as hazardous under the Québec regulation as such may not be disposed of at sites subject to the solid waste regulation (Règlement sur déchets solides – RDS) or the Regulation on landfilling and incineration of residual materials (Règlement sur l'enfouissement and l'incinération de matières résiduelles – REIMR).

A 2004 Ministère de l'environnement assessment of the hazardous nature of primary batteries concluded that alkaline batteries are corrosive materials and that lithium batteries are flammable materials according to the Regulation with respect to hazardous materials. Only zinc-carbon batteries do not meet the Regulation's hazardous materials criteria. This means that upwards of 70% of primary batteries sold in Québec in 2004 were hazardous materials.

6 THE PROPOSED QUÉBEC REGULATION

The means chosen for regulating consumer batteries under EPR is to include a specific appendix dealing with these products in the draft EPR framework regulation currently being prepared. This section describes specific steps with respect to batteries that should be covered in this appendix, including a list of target products, recovery and recycling objectives to be set, envisaged collection schemes and implementation delays.

6.1 Target products

All consumer batteries will be targeted, including portable batteries generally less than 1 kg in weight, rechargeable or not. The decision to target all batteries is based on European experience that shows that an "all battery" collection system is required since consumers have difficulty distinguishing between different battery types and, consequently, programs set up solely for the collection of batteries that contain toxic metals have never achieved satisfactory results. The proposed appendix will not target industrial and automobile batteries, whose weights are in general greater than 1 kg. The main target consumer battery categories are thus those generally mentioned by manufacturers, as follows:

- Cylindrical primary batteries: carbon-zinc (ZnC) batteries, ($ZnMnO_2$) alkaline batteries, zinc-air (ZnO_2) batteries and lithium ($LiMnO_2$) batteries
- Primary button batteries: silver oxide ($ZnAgO_2$) button batteries, zinc-air (ZnO_2) button batteries and mercury oxide (ZnHgO) button batteries
- Secondary batteries: nickel-cadmium (Ni-Cd) batteries, metallic nickel-hydride (NiMH) batteries, lithium-ion (Li-ion) batteries, lithium-ion polymer (Li-polymer) batteries and sealed lead acid (SLA) batteries.

yes&lang=english

6.2 Objectives

Performance objectives for recovery systems to be implemented by producers will be established by taking account of the fact that every battery that is sold is recoverable. Producers will be asked to propose a method for calculating battery recovery rate that accounts for the annual numbers of batteries recovered and units sold (or equivalent weight) estimated by using battery life and length of storage after their end of useful life. A mechanism involving producers, RECYC-QUÉBEC and the MDDEP will be set up to validate and authorize this calculation method. Should no calculation method be proposed nor authorized, or if the data supporting the use of such methods is not submitted in a timely manner, recovery rate objectives shall be set using average declared producer sales for the previous three years.

Thresholds will take account of current consumer battery recovery rates in Québec that are between 3% and 5%, of consumer battery recovery objectives set by European Directive 2006/66/CE, i.e. 25% no later than by September 26, 2012 and 45% by September 26, 2016, as well as the results of programs that have been implemented elsewhere in the world (Table 4). Similar considerations led Waste Diversion Ontario to suggest a recovery rate for primary batteries of 25% after 5 years in its program submitted to Environment Ontario in May 2007.

Table 4. Recovery rates for consumer batteries achieved in Europe in 2004[23]

	Age of program	**Performance**
Belgium	9 years	56.3%
Austria	14 years	40.8%
Germany	6 years	36.0%
France	4 years	21.0%
Poland	2 years	7.0%

Objectives to be reached as of two and five years from the date of program implementation will be mandated in the appendix. On the basis of a five-year report, objectives for the five subsequent years will be set by government decision after consulting with producers regarding a to-be-determined mechanism. Until new objectives have been set, recovery rates should increase by 20% per year. This formula allows for setting realistic and equitable performance objectives that are well adapted to consumer batteries.

[23] Rate calculated in 2004 by the European Portable Battery Association using mean sales for the previous three years

6.3 Collection schemes

The appendix on consumer batteries will set minimum requirements with respect to collection sites that are to be made available to consumers by producers (number and types of collection sites, territory served, accessibility criteria, etc.). Battery collection sites may be twinned with sites established for certain electronic products as deemed appropriate by producers. Batteries removed from electronic devices will remain the responsibility of producers of the devices who may however hire an organization of their choice that meets their requirements as well as those of current regulations for purposes covered by the regulation. While leaving the choice of means in the hands of producers, rules will be set to ensure that adequate collection services are available to the population throughout Québec.

6.4 Implementation delay

Dispositions relative to the implementation of an EPR approach in Québec allow producers to set up individual recovery and reclamation programs or join an organization that has been accredited by RECYC-QUÉBEC for implementing and managing a collective program on behalf of its members. In order to give producers the time needed to choose between the two options and prepare their programs, a delay of approximately one year has been proposed between the adoption of the appendix and program implementation. Moreover, the appendix will allow producers to gradually establish the required total number of collection sites over the course of three years.

7 CONCLUSION

This document describes the status of consumer batteries in Québec and shows that adopting a regulation aimed at recovery and recycling of all types of consumer batteries is opportune in the current context. This regulation will allow for diversion of toxic substances like lead and cadmium from landfill sites and will provide citizens and municipalities with the means to meet regulatory requirements with respect to the management of hazardous household waste.

Additionally, citizens have already expressed their concerns with respect to end of useful life management of consumer batteries through the media and particularly with the recent publication of a study prepared for Environment Canada on this issue. Adopting a regulation that gives industry the responsibility for managing consumer batteries over the course of their useful life would be an appropriate way of responding to these concerns.

Moreover, choosing EPR in the area of consumer batteries in Québec follows the international trend that aims to make producers responsible for products they sell that have reached their end of useful life. This approach was already chosen as a principle in the Québec Residual Materials Management Policy 1998-2008 action plan. Current regulations aimed at managing oils and paints according to EPR were the first to be adopted.

It is thus justified to prepare an appendix aimed at consumer batteries in the draft EPR framework regulation. In this way, the release of contaminants into the environment will be

diminished, use of resources will be optimized and achieving the objectives of the Québec Residual Materials Management Policy 1998-2008 will be supported.