



## **Why the Canadian Environmental Protection Act (CEPA) must give priority to the Substitution of Toxic Chemicals**

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Dear Committee members

I am the International Director of Clean Production Action, a non profit research and advocacy organization dedicated to the promotion of clean production in manufacturing and sustainable product design among companies. As part of our networking we partner with progressive companies who are working to advance green chemistry practices throughout their supply chain.

Today I wish to make the case that CEPA must integrate the Substitution Principle to make our Canadian chemicals policy truly protect the health of Canadians. CEPA 1999 can be made stronger by clarifying the opportunities to adopt safer chemicals. Furthermore the new European chemicals policy, REACH, is now in its final stages and substitution is a priority focus for both the European Parliament and the European Council of Ministers. This new proposed shift in European chemicals management – regardless of the final wording of the legislation – will have great impact on Canadian trade. An integrated focus on the substitution of hazardous chemicals with safer alternatives will not only benefit Canadian manufacturers on the world stage but will provide the necessary support for our burgeoning network of green chemistry researchers and advocates of this innovative and emerging technology development within Canada.

## **Establishing the Substitution Principle as central to chemicals policy**

**The Canadian Environmental Protection Act defines pollution prevention as a range of options but gives no priority to the substitution principle. This may entrench chemical users into ongoing hazardous chemical use.**

Do we in Canada promote substitution of hazardous chemicals by safer chemicals? The Canadian Environmental Protection Act is there “*to protect the environment and human health in order to contribute to sustainable development by identifying and managing risks from existing sources of pollution, and preventing the creation of new pollutants.*” This implies we cannot rectify the mistakes of the past – i.e. if a toxic chemical was synthesized and used widely in commerce, we can only ‘identify and manage the risks’

We also define no clear vision of a non-toxic future with measurable benchmarks. We lack a programme that works towards the mass adoption of green chemistry and often we opt for hazard management based on emission controls.

Our primary tool to realize the adoption of safer chemicals is that of pollution prevention planning, triggered within CEPA by the designation of a chemical to be CEPA toxic (Schedule 1 of the Act). The definition of P2 is “the use of processes, materials, products...that avoid or minimize the creation of pollutants and waste...” There is no explicit reference to actual material substitution. The response to a CEPA toxic substance could therefore, just as easily be an end of pipe control which simply minimizes emissions.

Even substances designated for ‘virtual elimination’ will not necessarily trigger the search for safer alternatives and substitute materials since virtual elimination is defined as “reduction of the quantity or concentration of the toxic substance in an emission, effluent, or waste released to the environment, so that the quantity or concentration is below a level set by the Ministers of the Environment and Health.” It seems obvious that a chemical target for ‘elimination’ should predicate the search and adoption of safer materials, but again, this is not stipulated in the definition. In fact of the 68 chemicals put on the Toxic Substances List only one chemical has been targeted for virtual elimination.

### **What is the Substitution Principle?**

*Substitution means the replacement or reduction of hazardous substances in products and processes by less hazardous or non hazardous substances or by achieving an equivalent functionality via technological or organizational measures.<sup>1</sup>*

In other words a hazardous chemical can be replaced by a safer or non-hazardous chemical, or the chemical’s function in the product or process can be met through product redesign or system change.

## How is this different to Pollution Prevention?

Substitution is a paradigm shift in chemical management because it does not attempt to simply limit exposure to hazardous chemicals or attempt to maintain ongoing use of hazardous chemicals through risk assessment and control.

- It is based on comparative assessment of alternatives to problem chemicals.
- It uses inherent hazard assessment as the basis for initial alternatives assessment, not risk assessment. Exposure assessment comes in at a second step once inherently safer materials are ranked.
- It provides a longer term view of the results of phase-out legislation, i.e. the substitution for the banned chemical has been assessed for 'safer' status.
- It forces innovation, particularly in the development and adoption of Green Chemistry. Green Chemistry integrates environmental and health considerations at the outset of new chemical synthesis to ensure new chemicals are inherently safe. Green Chemists can also predict, based on molecular structure, if a chemical is likely to cause cancer, reproductive hazards or persist in the environment, thereby allowing quick screening of existing chemicals.
- It forces innovation in product redesign and system change since substitution can be a process or material change, not just a chemical change. For example the phase out of brominated flame retardants by some IT companies resulted in redesign of the product:- use of metal casings in laptop to obviate the need for chemical flame retardant in plastic housings; separation and isolation of the potential spark source within the main frame.
- It implements the Precautionary Principle. Arguments against the Precautionary Principle commonly centre on what degree of evidence of harm is necessary before action is taken to restrict the use of a substance. When applying the substitution principle, it is not necessary to wait for elusive evidence of cause and effect if alternatives with less hazardous intrinsic properties are available.

### **The problem with pollution prevention versus Substitution Principle: Summary case study – PERC use in drycleaning.**

The recent regulations on PERC (Tetrachloroethylene) Use in the Drycleaning sector have lead more to 'innovative end of pipe control' rather than a transition to alternative cleaning agents that are less hazardous.

PERC has been listed on the Priority Substances list since 1989 due to its ubiquitous presence in groundwater and its toxicity to humans. It is toxic to the liver and the central nervous system, can accumulate in the body and is probably carcinogenic to humans. The compound induces leukaemia in rats and increases risk for oesophageal cancer, non-Hodgkin's lymphoma and cervical cancer. It is found in the breath and breast milk of lactating women who work in drycleaning establishments and has been found to contaminate bread, meat and butter from neighbouring shops.<sup>2</sup>

In 2000 PERC was added to the CEPA 1999 list of toxic substances and in February 2003 regulations were drawn up. However the **purpose of the Regulations is to reduce PERC releases to the environment from dry cleaning facilities – not to push for substitution** through tax credits, training or research and development. Although the NOPP and Canadian Centre for Pollution Prevention have information and a database on some alternatives to PERC the voluntary uptake by industry has been minimal due to lack of awareness of available substitutes. Indeed the Regulations mention nothing of substitute solvents or processes but mandate that reductions of emissions will be attained by requiring newer, more efficient (and expensive) dry-cleaning machines, minimizing spills of PERC and managing the collection and disposal of residue and waste water.<sup>3</sup> In effect the long process of listing PERC as CEPA toxic has resulted in end of pipe controls and has entrenched drycleaners and consumers into on-going hazardous chemical use and exposure.

Note from author: This situation was validated by a trip to my local drycleaner in Montreal who told me that Feds had visited his establishment, told him he had to invest in a multi-thousand dollar upgrade PERC recycling machine but gave him no information on alternatives such as Wet cleaning or liquid carbon dioxide machines. “I know this stuff is killing me,” he told me, “but it’s my living.” There is no trade association in Quebec or P2 outreach to give him and others information or training on alternatives. A subsequent call to Environment Canada in Quebec revealed that an initial fact sheet had been made available but in short, the dissemination of information and training had fallen through the cracks and was now inactive.

Yet alternatives exist, as Environment Canada’s own research has found. The disconnect has been due to lack of active dissemination of information on alternatives to perc, increased cost of wet cleaning and CO2 machines with no subsidies available to increase their uptake, the ongoing use of ‘dryclean only’ labels in clothes and a general lack of awareness on the part of drycleaners and customers alike about the serious health threats from perc exposure. There is no dedicated and ongoing training throughout Canada on alternative methods of cleaning. If there is, drycleaners do not know of it. Yet, decreasing the emissions from drycleaning machines will not prevent exposure in the workplace nor will it prevent exposure in the home from direct offgassing from ‘cleaned’ clothes. The International Committee of Textile Care is voting this year on whether to establish a Wet-cleaning label for clothes to remove one of the significant barriers to wet cleaning uptake.

Financial incentives could be brought in to support training and uptake of safer technology. Through the Canada Small Business Financing Program (CSBFP) of Industry Canada, the Government of Canada created the Capital Leasing Pilot Project and the Small Business Loans Program to assist small businesses, including dry cleaners, in financing fixed assets and other materials. A dry cleaner may apply to a financial institution or a participating leasing company of its choice for a loan or lease under these programs at prime rate.. If the application is granted, the federal government will guarantee 85% of the lender’s losses in the event of default. However the loan seemingly only applies to perc emission reduction machines as this is what has been stipulated in the

regulations. It is crucial that these small business loans be revised to encourage the adoption of safer drycleaning techniques. Other incentives could be brought in.

**Will Brominated Flame Retardants (PBDEs), once designed CEPA-toxic, be replaced by other brominated chemicals? Will CEPA strive for emission control or actual substitution?**

*At the very least, we recommend that where synthetic chemicals are found in elevated concentrations in biological fluids such as breast milk and tissues of humans, marine mammals or top predators, regulatory steps be taken to remove them from the market immediately.*

— Royal Commission on Environmental Pollution, UK - Chemicals in Products, 2003

Polybrominated biphenyl ethers (PBDEs) are now ubiquitous contaminants in our environment and Canadians now have the second highest levels globally of these chemicals in our bodies. PBDEs, called the PCBs of the 21<sup>st</sup> century, are linked to nervous system disorders, thyroid dysfunction and reproductive damage to the developing fetus. Health Canada has extensively documented its ongoing increase in the environment and in human populations but to date there is no way forward as to how, or indeed if, PBDEs will be phased out of production and use in Canada. A recent CTV study of PBDEs in food created some minor furore within the House of Commons demanding action by the government to ban these chemicals with a response from Health Canada that studies were still underway. How much evidence is needed to take action?

*“Brominated flame retardants should not be used where suitable replacements are available, and future efforts should encourage the development of further substitutes.”*

— World Health Organization’s International Programme on Chemical Safety, (1999)  
Environmental Health Criteria 205: Polybrominated dibenzo-p-dioxins and dibenzofurans

In comparison, in 1989 Germany agreed to voluntarily cease production of PBDEs due to human health concerns and within the European Union new electronic products must not contain PBDEs as of July 2006. Levels of PBDEs in the Swedish public declined a year after the government regulated the phase out of PBDE use in industry in 1999.<sup>4</sup>

**Government initiative to Research the Alternatives**

To speed the phase out of PBDEs, Germany, Denmark and Sweden have extensively researched the available alternatives to brominated flame retardants. Working with the limited studies available, both the Danish and German governments have issued reports that evaluate the human health and toxicity data for a wide range of flame retardants, including those BFRs targeted for phase out. The German Environmental Protection Agency used the substitution principle to assess and rank thirteen flame retardants based on toxicity to humans and the environment and their suitability to work within closed loop material systems.

Both reports conclude that the use of halogen free flame retardants is a good first step forward in making the product safer. However more research is needed to fill in the data gaps on environmental and human health profiles where necessary.

Substitution of BFRs and other chemical classes of high concern is already happening among progressive companies and these case studies have been extensively documented.<sup>5</sup> A variety of reasons exist for why some companies are searching for safer substitutes while other don't and these include regulatory drivers such as the recent European Directive on the Restriction of Hazardous Substances in electronic equipment, increased public awareness, demands from downstream users or clients, liability issues, competitive advantage and company ethics.

However, there are also barriers and the development and adoption of safer substitutes is happening only slowly, in a piecemeal fashion and in some sectors not at all. *An extensive overview of the incentives and barriers to substitution prepared for the European Union concluded that well-designed regulatory signals are needed because market forces alone often fail to provide a competitive advantage for the safer product, particularly where the markets are "too far away" from consumer awareness to be influenced by the potential demands of consumers.*<sup>6</sup>

### **Companies agree with environmental groups that the Substitution Principle is a necessary tool**

In 2005 the Confederation of British Industry, the Chemical Industries Association and Greenpeace issued a common statement regarding the efficacy of substitution within the new EU Chemicals policy<sup>7</sup>. They jointly declared that:

*'substances requiring an authorisation within REACH ...i.e. substances of very high concern, should be replaced with less hazardous alternatives wherever and whenever practicable.*

They also stated that

*'Authorisations granted for uses of substances of very high concern should be time-limited appropriately such that the benefits of emerging alternatives can be realised as soon as possible.'*

They further conclude:

*'We therefore urge the Minister to press for substitution to be incorporated into REACH in such a way that the authorisation procedure is effective, but flexible, in progressively phasing-out substances of very high concern.'*

This is an important recognition that alternatives need to be substituted for hazardous chemicals and NOT an endorsement of exposure control -- as currently detailed within our CEPA.

## Integrating the Substitution Principle Internationally – and what Canada can learn

*Without the strong support of the Substitution Principle, it will be difficult for an individual company that is a downstream user to be proactive in substituting substances.*  
- Skanska AB, response to internet consultation, summer 2003. Skanska is the second largest construction contractor in the world.

**In Sweden the principle of substitution is enshrined in Chapter 2 Section 6 of the Environmental Code<sup>8</sup>** which states:

*Persons who pursue an activity or take a measure, or intend to do so, shall avoid using or selling chemical products or biotechnical organisms that may involve risks to human health or the environment if products or organisms that are assumed to be less dangerous can be used instead. The same requirement shall apply to goods that contain or are treated with a chemical product or a biotechnical organism.*

Case study summary:

Sweden has effectively used the principle in its pesticides regulations. Beginning in 1990 a re-registration every 5 years for pesticides now includes a comparative assessment of substitutes. The year before the re-registration started, 619 pesticides were registered. The introduction of the substitution requirement caused a temporary decrease in numbers and only 343 appeared on the market the year after. Some pesticides were rejected for re-registration; others were substituted with better alternatives and for others the producers did not apply for re-registration because they realised that their products did not fulfil the requirements and would be substituted. The temporary decrease in pesticide use lasted a few years, but today more than 700 pesticides are registered, demonstrating a wider range of products which are safer for human health and the environment.<sup>9</sup>

Regulations stipulating the phase out or ‘sunset’ of problematic chemicals have provided the backbone of chemicals policy in Sweden. **The government also directly helps industrial sectors to research and adopt safer materials.** For example the government uses a comparative methodology known as “Seven Steps to Substitution” to explore the feasibility and availability of substitutes. It has also developed the PRIO interactive database which contains both substances that are regulated and those that are not covered by any legislation. PRIO provides data on the intrinsic health properties and environmental properties of substances. Through an interactive website, it allows companies to assess their chemical use, examine the opportunity for risk reduction through substitution and anticipate future legislation.<sup>10</sup>

**The Substitution Principle is further clarified and enhanced by the sustainability goal of a non-toxic future within Sweden’s chemical policy.** The country has set fifteen environmental quality objectives adopted by Parliament in 1999 and which provide a coherent framework for environmental programmes and initiatives at national, regional and local level.<sup>11</sup> Government and industry now work towards these timelines

and the government publishes yearly assessment reports on the web to see if progress is being made.<sup>12</sup> Indeed, the generational goal to eliminate hazardous substances by 2020 is the basis and much of the impetus for the overhaul of Europe's chemical management.

*"These two principles [precaution and substitution] are important principles in the Swedish national chemical policy and has proven to be a good basis for chemical control. Tetra Pak is therefore supportive to building the REACH system on these two fundamental principles. Precaution and substitution need to be introduced early in the text as guiding principles for the whole policy*

- internet submission by Tetra Pak on REACH June 2003, Public comment period

**In both Germany and in the UK (UK Control of Substances Harmful to Health (COSHH) Regulations) the substitution of hazardous produces (where possible) is obligatory in the workplace.** The German federal environment ministry also recommends substitution as the method for dealing with endocrine disrupting chemicals. In 1999 the UBA stated: *Substances whose endocrine potential has been shown in vivo tests, but where the available data is (as yet) insufficient for legal restriction or prohibition, should be named publicly in blacklists, and made subject to a substitution requirement under the Hazardous Substances Ordinance. Such a list could provide sufficient incentive to substitute, even where there is only a suspicion of danger.*<sup>13</sup>

### **Substitution will be integrated into the EU chemicals policy, REACH<sup>14</sup>**

REACH is entering its final stages of drafting. The issue of substitution is a focal point for negotiations between the European Parliament and the Council. The UK, which currently holds the Council Presidency, hopes to obtain a political agreement during the meeting of the Competitiveness Council on November 28. In order for the legislative process to be completed, it will be necessary for the common position adopted by the Council to take on board all of Parliament's amendments. Otherwise a second reading will take place, which could involve nearly a year's additional work.

Under REACH any chemical known to be a carcinogen, a mutagen, reproductive toxic, very persistent, very bioaccumulative or of similar concern, such as endocrine disrupting chemicals, would need to go through an authorisation process before being put on the market. Both the European Parliament and the European Council (representatives from each of the member states) have drafted language on substitution.

**Both agree that any application for authorisation must submit an analysis of the alternatives considering their risks and the technical and economic feasibility of substitution.**

However the emphasis then changes with the European Parliament advocating for the mandatory substitution of any chemical targeted for authorisation whereas the Council believes adequate control should be the priority focus with substitution a fall back position.

A few days ago on 10 October 2006, the Environment Committee of the **European Parliament** reaffirmed its position adopted on November 2005<sup>15</sup>. The Parliament reaffirmed its backing for **mandatory substitution** of substances of very high concern where safer alternatives exist. Where no such alternatives are available and where the benefits to society outweigh the risks connected with the use of such substances, the aim is then to ensure that the use of substances of very high concern is properly controlled and that alternatives are encouraged. Authorisations would be limited to five years and would have to be accompanied by a **substitution plan**.

In contrast the **European Council** in its Common Position of 12 June 2006<sup>16</sup> states that an authorisation shall be granted if the risk to human health or the environment from substances of very high concern is adequately controlled. If this can not be adequately demonstrated, authorisation will still be granted if it is shown that socio-economic benefits outweigh the risk to human health or the environment arising from the use of the substance and if there are no suitable alternative substances or technologies.

The Council also recommended that there be no specific time limit but that they will remain valid ‘until the Commission decides to amend or withdraw the authorisation in the context of a review.’ In this review period the holder of an authorisation ‘shall submit an update of any substitution plan included in his application. If the holder cannot demonstrate that the risk is adequately controlled, he shall submit an update of the socio-economic analysis, analysis of alternatives and **substitution plan** contained in the original application. If he can now demonstrate that the risk is adequately controlled, he shall submit an update of the chemical safety report.’

Furthermore:

Authorisations may be reviewed at any time if:

- (a) the circumstances of the original authorisation have changed so as to affect the risk to human health or the environment, or the socio-economic impact; or
- (b) **new information on possible substitutes becomes available**.<sup>17</sup>

The emphasis on control (Council) versus mandatory substitution (Parliament) is the crux of the disagreement. But it is worth noting that in both submissions the issue of substitution plans and alternatives research are included. Whatever the outcome of the final REACH text substitution will remain a primary theme.

### **Recommendations for CEPA**

It is for this reason that CEPA must refocus its mandate by demanding the mandatory substitution for all CEPA toxic chemicals. Similarly the Domestic Substances List screening should flag the need for substitution planning. Canada has a burgeoning Green Chemistry Network<sup>18</sup> and CEPA needs to be a catalyst for its promotion. I hope to submit specific language to reflect this need in the coming weeks while the CEPA review continues. I thank you for giving me the opportunity to present this paper and I look forward to further discussion.

## Appendix 1

### **CBI, CIA, Greenpeace Common position with regard to the authorisation of substances of very high concern within REACH 2003**

The Confederation of British Industry, the Chemical Industries Association and Greenpeace share the common position that substances requiring an authorisation within REACH according to Title VII, Article 54 of the Commission's proposal (*i.e.* substances of very high concern) should be replaced with less hazardous alternatives wherever and whenever practicable.

We agree that, for the authorisation procedure to be justified, effective and fair:-

- Substances of very high concern must be identified as such through the application of a robust, science-based and transparent process, co-ordinated at a European level and subject to European agreement.
- The authorisation procedure must be flexible enough to provide for authorisations to be granted where justified by the absence of available alternatives and by the balance of socio-economic benefits over risks to human health and the environment.
- "Availability" of an alternative in this context implies the existence of an alternative - capable of providing an acceptable level of performance - acceptable to the regulator, user, (and consumer if relevant )at a cost that is not prohibitive and whose supply is adequately assured.
- The requirements for resources to be invested in the search for available alternatives should be proportional to the benefits expected from substituting the substance.
- Authorisations granted for uses of substances of very high concern should be time-limited appropriately such that the benefits of emerging alternatives can be realised as soon as possible.

We share the view that a requirement within the authorisation procedure to substitute substances of very high concern if an acceptable alternative that does not fall into the very high concern category is available has the potential to drive innovation to the benefit of business, human health and the environment. However, to be effective, substitution will require commitment from the total supply chain, not just from producers.

We therefore urge the Minister to press for substitution to be incorporated into REACH in such a way that the authorisation procedure is effective, but flexible, in progressively phasing-out substances of very high concern.

## Appendix 2

### COUNCIL OF THE EUROPEAN UNION Common Position on REACH Brussels, 12 June 2006

#### Summary of Substitution in Authorisation Procedure (edited by author)

##### Aim of authorisation

The aim of this Title is to ensure the good functioning of the internal market while assuring that the risks from substances of very high concern are properly controlled **and that these substances are eventually replaced by suitable alternative substances or technologies where these are economically and technically viable.**

##### Substances to be included in Annex XIV

The following substances may be included in Annex XIV in accordance with the procedure laid down in Article 57:

- (a) substances meeting the criteria for classification as **carcinogenic** category 1 or 2 in accordance with Directive 67/548/EEC;
- (b) substances meeting the criteria for classification as **mutagenic** category 1 or 2 in accordance with Directive 67/548/EEC;
- (c) substances meeting the criteria for classification as **toxic for reproduction** category 1 or 2 in accordance with Directive 67/548/EEC;
- (d) substances which are **persistent, bioaccumulative and toxic in accordance with the criteria** set out in Annex XIII of this Regulation;
- (e) substances which are **very persistent and very bioaccumulative** in accordance with the criteria set out in Annex XIII of this Regulation;
- (f) substances - such as **those having endocrine disrupting properties** or those having persistent, bioaccumulative and toxic properties or very persistent and very bioaccumulative properties, which do not fulfill the criteria of points (d) or (e) - for which there is scientific evidence of probable serious effects to human health or the environment which give rise to an equivalent level of concern to those of other substances listed in points (a) to (e) and which are identified on a case-by-case basis in accordance with the procedure set out in Article 58.

## **Granting of authorisations**

### **Article 59**

Without prejudice to paragraph 3, **an authorisation shall be granted if the risk to human health or the environment from the use of a substance arising from the intrinsic properties specified in Annex XIV is adequately controlled in accordance with section 6.4 of Annex I and as documented in the applicant's chemical safety report.** The Commission shall take into account all discharges, emissions and losses known at the time of decision.

4. If an authorisation cannot be granted under paragraph 2 or for substances listed in paragraph 3, an authorisation may be granted if it is shown that socio-economic benefits outweigh the risk to human health or the environment arising from the use of the substance **and if there are no suitable alternative substances or technologies.**

This decision shall be

taken after consideration of all of the following elements:

- (a) the risk posed by the uses of the substance;
- (b) the socio-economic benefits arising from its use and the socio-economic implications of a refusal to authorise as demonstrated by the applicant or other interested parties;
- (c) **the analysis of the alternatives submitted by the applicant under Article 61(4)(e) and any third party contributions submitted under Article 63(2);**
- (d) available information on the risks to human health or the environment of any alternative substances or technologies.

## **Article 60**

### **Review of authorisations**

Authorisations granted in accordance with Article 59 shall be regarded as valid until the Commission decides to amend or withdraw the authorisation in the context of a review, provided that the holder of the authorisation submits a review report at least 18 months before the expiry of the time-limited review period.

**A holder of an authorisation granted in accordance with Article 59 shall submit an update of any substitution plan included in his application. If the holder cannot demonstrate that the risk is adequately controlled, he shall submit an update of the socio-economic analysis, analysis of alternatives and substitution plan contained in the original application.** If he can now demonstrate that the risk is adequately controlled, he shall submit an update of the chemical safety report.

**Authorisations may be reviewed at any time if:**

- (a) the circumstances of the original authorisation have changed so as to affect the risk to human health or the environment, or the socio-economic impact; or
- (b) new information on possible substitutes becomes available.

## Article 61

### Applications for authorisations

1. An application for an authorisation shall be made to the Agency.

**4. An application for authorisation shall include the following information:**

- (a) the identity of the substance(s), as referred to in section 2 of Annex VI;
- (b) the name and contact details of the person or persons making the application;
- (c) a request for authorisation, specifying for which use(s) the authorisation is sought and covering the use of the substance in preparations and/or the incorporation of the substance in articles, where this is relevant;
- (d) unless already submitted as part of the registration, a chemical safety report in accordance with Annex I covering the risks to human health and/or the environment from the use of the substance(s) arising from the intrinsic properties specified in Annex XIV;
- (e) an analysis of the alternatives considering their risks and the technical and economic feasibility of substitution.**

**5. The application may include:**

- (a) a socio-economic analysis conducted in accordance with Annex XVI;
- (b) where appropriate a substitution plan, including research and development and a timetable for proposed actions by the applicant;**

## REFERENCES

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<sup>1</sup> Oko-Institute e.v, (2004) Never Change a Running Process? Also see 6.

<sup>2</sup> IARC (1995) Tetrachloroethylene (Group 2A) IARC Summaries and evaluation. VOL:63 (p. 159); ATSDR (2000) Toxicological profile for tetrachloroethylene.

<sup>3</sup> Environment Canada. Compliance Guide for Dry Cleaners. June 2003

<sup>4</sup> McPherson, A; Thorpe, B. (2004) Brominated Flame Retardants in Dust on Computers: The case for Safer Chemicals and Better Computer Design. Available at [www.cleanproduction.org](http://www.cleanproduction.org)

<sup>5</sup> Thorpe, Beverley. (2003) Safer Chemicals Within Reach. Greenpeace Environmental Trust UK. Also at [www.cleanproduction.org](http://www.cleanproduction.org)

<sup>6</sup> Lohse, Joachim et al. Never Change a Running Process? Substitution of Hazardous Chemicals in Products and Processes: Definition, Key Drivers and Barriers. Greener Management International. Issue 41, 2003.

<sup>7</sup> See Appendix 1

<sup>8</sup> <http://www.regeringen.se/content/1/c4/13/48/385ef12a.pdf>

<sup>9</sup> Rosander, Per. 2003. Substitution in Swedish Pesticide Regulations. Chemical Secretariat, Stockholm.

<sup>10</sup> . The steps presented are based on the document 'sju steg till substitution' ('seven steps to substitution') and the method presented in the Prevent document Kemiska hälsorisker (Chemical health risks) See more details at [http://prio.kemi.se/templates/PRIOEngframes\\_970.aspx](http://prio.kemi.se/templates/PRIOEngframes_970.aspx)

<sup>11</sup> <http://www.miljomal.nu/english/english.php>

<sup>12</sup> <http://www.miljomal.nu/english/objectives.php>

Summary of the timeline:

By 2010 products will carry health and environmental information on any dangerous substances they contain. Newly manufactured products will as far as possible be free from:

- 
- carcinogenic, mutagenic and reproductive toxic substances, by 2007, if the products are intended to be used in such a way that they will enter natural cycles;
  - new organic substances that are persistent and bioaccumulative, as soon as possible, but no later than 2005;
  - other organic substances that are very persistent and very bioaccumulative, by 2010;
  - other organic substances that are persistent and bioaccumulative, by 2015;
  - mercury by 2003, and cadmium and lead by 2010

<sup>13</sup> UBA (2001) Chemicals in the Environment which interfere with the Endocrine Systems of Humans and Wildlife – Pollution, Effects, Control Strategies.

<sup>14</sup> REACH stands for the Registration, Evaluation and Authorization of Chemicals. This new legislation to be passed in early 2007 will overhaul the current legislative framework for chemicals management within the 25 countries of the European Union. It will also apply to all imports of chemical substances into the EU.

<sup>15</sup> [http://www.europarl.europa.eu/news/expert/infopress\\_page/064-11481-282-10-41-911-20061009IPR11474-09-10-2006-2006-false/default\\_en.htm](http://www.europarl.europa.eu/news/expert/infopress_page/064-11481-282-10-41-911-20061009IPR11474-09-10-2006-2006-false/default_en.htm)

<sup>16</sup> [http://www.consilium.europa.eu/ueDocs/cms\\_Data/docs/pressdata/en/misc/90268.pdf](http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressdata/en/misc/90268.pdf)

<sup>17</sup> The full text of the Council Common Position is given in footnote 16 however relevant parts of the position are replicated in Appendix 2

<sup>18</sup> [www.greenchemistry.ca](http://www.greenchemistry.ca)