the LOUISVILLE CHARTER

BACKGROUND PAPER FOR REFORM NO. 1 OF THE LOUISVILLE CHARTER FOR SAFER CHEMICALS

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Reform No. 1 of the Louisville Charter for Safer Chemicals reads:

REQUIRE SAFER SUBSTITUTES AND SOLUTIONS

Require Safer Substitutes and Solutions—seek to eliminate hazardous chemical use and emissions by altering production processes, substituting safer chemicals, redesigning products and systems, and rewarding innovation. Safer substitution includes an opportunity and obligation on the part of the public and private sectors to invest in research and development for sustainable chemicals, products, materials and processes.

ABSTRACT

Currently, chemical regulations in the United States do not prioritize the production and use of inherently safe chemicals. At present when regulations get passed to target a chemical for control, safer substitutes are not the goal nor are there specific guidelines or tools used to achieve Green Chemistry, Clean Production or sustainable product design. In most cases, the replacement is often just as hazardous or simply a reduction of the quantity or concentration of the toxic substance that has been targeted. In contrast, by placing the Substitution Principle at the heart of new chemical policies and regulations, hazardous chemicals would be replaced with less hazardous alternatives or preferably alternatives for which no hazards can be identified. This would hasten the uptake of Green Chemistry, or environmentally benign chemical synthesis. However substituting hazardous chemicals goes beyond finding a drop-in chemical alternative and can include systems, materials or process changes. Regulatory drivers include a clear timeline for phase out of priority chemicals based on their inherent hazard, mandatory substitution planning for hazardous chemicals, financial and technical support for companies to find safer materials, and increased funding for Green Chemistry development and uptake by companies.

Making the Substitution Principle the Cornerstone of Sustainable Chemical Policies and Moving towards Clean Production and Innovation

"It will be obvious when chemists have fulfilled their singular historic obligation to promote sustainability…Every newly graduated chemist will have a thorough understanding of the fundamentals of sustainability ethics, toxicity and ecotoxicity and will know how to avoid pollution when designing chemicals and chemical processes. Chemists will have developed non-polluting affordable technologies suitable for mass distribution that can convert solar to electrical and chemical energy with high efficiency. Through the properly informed design of chemicals and chemical processes, an economically vibrant, safe technology base will have been invented that is attractive to industry while being neither toxic nor ecotoxic."

TERRY COLLINS, Director, Institute for Green Chemistry, Carnegie Mellon University, USA. *Quoted in Green Chemistry, August 2003.*

The generation goal to phase out all carcinogens, mutagens and reproductive toxins within one generation (2020) requires the adoption of a sustainable chemicals policy within which the principle of substitution is the primary criteria for chemical management. With the principle of substitution as a framework, the promotion of safer chemicals in processes would be implemented within industrial sectors and the use of safer chemicals in products would be incorporated at the design stage.

The Principle of Substitution states that hazardous chemicals should be systematicallysubstituted by less hazardous alternatives or preferably alternatives for which no hazards can be identified. The Substitution Principle can be implemented by governments and companys.

In effect, the Substitution Principle moves us towards *Clean Production,* which can be defined as a way of designing products and manufacturing processes in harmony with natural ecological cycles. Clean Production aims to eliminate toxic waste and inputs and promotes the judicious use of renewable materials and energy. Such materials would not persist or bioaccumulate up the food chain and their use would pose no lasting danger to natural ecological processes. Clean Production seeks to mimic the properties of nature rather than attempt to control through destruction. Safer chemicals in processes and products would also allow for better material reuse and recycling, which would help to cut our resource use. North American per capita resource use is the highest in the world and double that of western Europe, necessitating an urgent reduction in material intensity to fulfil our 'needs' as well as an exponential rise in our material efficiency.

Moving to less or non hazardous alternatives provides a stimulus for innovation on all fronts as well as implementing the Precautionary Principle. Arguments against the Precautionary Principle commonly center on what degree of evidence of harm is necessary before action is taken to restrict the use of a substance. Using the Substitution Principle to advance Clean Production is a dynamic way of seeking continuous improvements, rather than defending the status quo through entrenched risk management of hazardous materials.

Implementing the Substitution Principle is a Political Act as Much as a Technical One

Implementing the Substitution Principle will involve opposing the vested interests of the halogenated chemical producers and others within the American Chemical Society. It will involve challenging the US government to define its sustainability path and it will necessitate community and citizen empowerment to demand change.

In North America, we have neither

a generational goal, nor a sustainable chemical policy, nor a focus on Clean Production within our manufacturing, transport, energy or food production systems. At present, when regulations finally get passed to target a chemical for phase out, the issue of what will be used instead is not adequately debated. There are no specific strategies to implement Green Chemistry, organic food production, solar energy or sustainable product design. In most cases, the replacement is often just as hazardous or simply a reduction of the quantity or concentration of the toxic substance. Even Pollution Prevention legislation in the United States lacks a clear focus on safer substitutes and Green Chemistry. Implementing the Substitution Principle is a political act as much as it is a technical and practical one.

Dry cleaning is a case in point—though perchloroethylene is recognized as a probable human carcinogen and continues to directly affect workers' health—current pollution prevention measures simply encourage better recycling systems, rather than mandating the use of alternative solvents or changes in process. It is not that safer alternatives don't exist: they do. But the lobby of the Halogenated Solvents Manufacturing Association, coupled with the lack of a clear mandate for substitution within the EPA and Environment Canada, allows the continued production and use of this known hazardous chemical.

The case of brominated flame retardant use in the United States is another example of the failure of our current system to evolve to safer chemicals. The bromine industry made a recent voluntary agreement to phase out two types of brominated flame retardant. However, instead of choosing a safer substitute, the industry is promoting another brominated chemical as a replacement. Again, no regulations exist mandating the use of intrinsically safer materials or the phase out of halogenated chemicals in general.

Defining Substitution

Substituting hazardous chemicals goes beyond finding a drop-in chemical alternative. Implementing sustainable chemical policy means asking first what function that chemical serves. Alternatives can then be analyzed from a *systems, materials, chemical, or process change.*

Pesticide use is a case in point: substitution would look at integrated pest management (process change), a change to organic farming techniques to reduce pests (systems change) as well as a move to less hazardous pesticide use (chemical substitution). Similarly, substitutions for brominated flame retardants must fulfil the function of flame retardancy, but this can be achieved at several levels: a chemical change (replacing BFRs with nitrogen-phosphorous chemicals), a material change (replacing plastic with metal casings in laptops or using an inherently inflammable wool fabric barrier on mattress covers), a product change (isolating the source of potential fire from flammable materials, e.g. isolating electronic circuit in computers from plastic housing), or a system change, (tackling the source of most household fires with compulsory self-extinguishing cigarettes and compulsory fire sprinklers in buildings.)

Core elements of substitution

- The Substitution Principle must be *mandatory* within regulations. 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.[1]
- *Identify priority chemicals and classes of chemicals for elimination*, eg PBTs, CMRs (carcinogens, mutagens, reproductive toxins), endocrine disrupting chemicals, all halogenated chemicals, heavy metals.
- Base this chemical elimination prioritization on *hazard assessment* (intrinsic properties of the chemical) and not risk assessment (the level of exposure most likely to occur during each stage of the product's lifecycle).
- Develop and implement *substitution plans* for priority chemicals—for both chemical producers and chemical users. Chemical users must work with product designers to examine the range of substitution choices available to them—not just chemical change. Chemical producers must adopt Green Chemistry principles and plan the transition to chemicals which will not persist or bio-magnify in nature and humankind.
- Recognize that incomplete data exists for most chemicals and that chemical producers must be accountable for *supplying missing data* by a specified deadline, otherwise no market would be allowed. Until this happens, chemical users should avoid classes known to be harmful and rely on chemical drop-in replacements with sufficient information.

- Ensure *financial instruments* support the move to Green Chemistry and do not entrench production of hazardous chemicals with subsidies and tax breaks.

Implementing Safer Substitutes: the Role of Government

1. Set Aspirational Goals with Timelines.

The generational goal in Europe has set an international benchmark and has influenced many countries and companies' chemical policies. Sweden, a major promoter of a new chemicals policy, has set timelines and defined specific goals to achieve a *non-toxic future* as one of fifteen environmental quality objectives. These fifteen objectives were adopted by Parliament in 1999 and they provide a coherent framework for environmental programmes and initiatives at the national, regional and local levels.[2]

For example Sweden's Interim targets for 2003/2005/2007/2010/2015[3] state that newly manufactured finished 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 bioaccumulating, 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.

2. Make the Substitution Principle the Cornerstone of Chemical Policy

A clear position must be made that substitution, not reduction or management of high risk chemicals, will be the cornerstone of chemical policy.

Sweden has effectively used the Substitution Principle to decrease hazardous pesticide use. They use a seven-step process which evaluates not only the intrinsic hazards of a chemical but its efficiency, its cost and its intended use. Alternatives are monitored and assessed for effectiveness. Since the Substitution Principle has been operational, 20% of the pesticides on the Swedish market have been substituted with less hazardous products.

The draft new European Union Chemical Policy if implemented properly will see a wide range of substitution activities. Environmental advocates and some European countries have been pushing to adopt stronger substitution requirements in the new policy. On Oct 25th, the Confederation of British Industry and the Chemical Industries Association issued a joint statement with Greenpeace that substances of very high concern should be replaced with less hazardous alternatives wherever and whenever practicable.

3. Declare Chemicals and Classes of Chemicals as Priorities for Elimination

For example, the UK government has targeted for elimination the entire class of nonyl phenol and its ethoxylates. Through its Stakeholder Forum, it concluded that it would take a considerable period of time (up to 4 years) for marketing and use controls to be agreed in the EU and implemented via UK legislation. The Forum therefore has established with industry a voluntary phase out plan to achieve quicker results. If phase out does not occur successfully in all industrial sectors, the UK will enact legislation[4].

3. Replace Subsidies for the Halogenated Chemicals Production with Green Taxes.

Ten years ago the International Joint Commission did many studies for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes Basin. The IJC recommended that a tax on chlorine and PVC would achieve virtual elimination and spur employment and adoption of substitutes for PVC.[5] Ten years later, neither of these recommendations have been put into action.

The Louisiana Coalition for Tax Justice found that the overwhelming majority of state tax exemptions in the 1980s went to four narrow industries, all high in toxic emissions and pollutants: utilities (36%) chemical plants (25%), oil refineries (19%) and pulp and paper mills (7%). Dow, Formosa plastics and Borden are a sample of the companies who received millions in subsidies and tax cuts, e.g. Dow Chemical received over $33.5 million and still created no permanent jobs in the state. Formosa Plastics received subsidies for its PVC production facility at a cost of over $200,000 per job[6]. In such cases, the jobs versus environment argument is unjustified. Yet these subsidies continue.

Green taxes are good incentives. In 1996 Denmark shifted revenue by lifting some of the taxes on wages and increasing by the same amount a tax

on carbon emissions, pesticides and chlorinated solvent use. Such 'tax shifts' or Ecological Tax Reform could tax the halogen producers, and subsidize green chemical producers with this income. The OECD (Organization of Economic Cooperation and Development of which the US is a part) continuously repeats its long-standing refrain that economic instruments such as taxes or trading systems offer the most economically efficient route to environmental goals.

4. Supply Research and Development Funding to Advance Safer Chemicals.

In the USA, H.R. 3970 Green Chemistry Research and Development Act of 2004 has passed the House but is awaiting a Senate sponsor. The bill would authorize the spending of $26 million on green chemistry in fiscal year 2005, $28 million in 2006, and $30 million in 2007. Although the bill was expected to receive support in the Senate, it is also probable that vested interests will oppose this or any further moves that would damage their market share of downstream chemical users.

5. Implement Mandatory Substitution Assessment Planning Requirements for Chemical Users

Substitution is already a goal for some progressive companies and case studies have been extensively documented. [7] A variety of reasons exist for why some companies are searching for safer substitutes 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 the development and adoption of safer substitutes is happening only slowly, in a piecemeal fashion and in some sectors not at all.

If a company uses a chemical that is classified as persistent (P), or bioaccumulative (B) or toxic (T), it should be required to provide a *Substitution Assessment Plan (SAP).* This should include a full description of the alternatives available, a comparative assessment of their intrinsic hazards and an assessment of technical feasibility. The Substitution Assessment should be transparent as to the methods and data used in seeking and assessing alternatives.

If the applicant demonstrates that no suitable alternative is available, and can justify that the use of P, B or T chemicals could be argued by demonstrating social need, a positive cost benefit analysis and adequate control, then this use must be time-limited. At the same time, a Substitution Development Plan should be required, so that chemical, process or function substitution can take place when the use permit expires.

A similar framework already exists in the United States—the Toxic Use Reduction Act of Massachusetts. Here, over 550 companies had to assess toxic use reduction options with technical help supplied by university and government experts. Toxic use reduction strategies included material substitution and product reformulation. Within ten years industry has reduced the use of toxic chemicals by 40%, by-product waste by 58% and toxic emissions by 80%. A cost benefit analysis reveals that the same companies saved a total of 14 million dollars over this period through the adoption of more efficient and safer processes.[8]

6. Provide Technical Assistance to Chemical Users

The Swedish government's Seven Steps to Substitution are based on comparative assessment and the feasibility and availability of substitutes. The government gives help to industry through its 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.[9] A variety of software tools in other countries exist to help industry assess alternatives.[10]

The UK, Germany, Denmark and Sweden have disseminated information on safer substitutes for specific industrial sectors as well as guidance documents for industry. The UK Government agrees with the Royal Commission's assessment of the importance of substitution and has decided that they "will take a more strategic approach to discussions with industry by examining substances of concern in groups of, say, 10 to 12 per Forum meeting . An approach which will, in turn, help to prepare UK industry for the requirements expected of it under REACH."[11]

In the United States, various EPA programs exist to help downstream users. Most notably the EPA's Green Chemistry Program, Green Engineering program, Design for the Environment program and the Pollution Pre-

vention Framework. However, these initiatives are voluntary, unlike the resources available to companies in Massachusetts who must prepare toxic use reduction plans as part of the Toxic Use Reduction Act.

7. Identify Safer Substitutes

The German Federal Department of the Environment and the Danish EPA researched alternatives to brominated flame retardants as well as the barriers to the uptake of substitution. Such information helps small and medium scale enterprises who cannot afford the level of research that corporate users can afford. The Danish environmental strategy prioritizes action on their dangerous substances list and encourages manufacturers and importers to find substitutes and to develop alternative products. The Danish EPA's Cleaner Products Support Programme grants subsidies to a number of projects that promote substitution. It supports the development, testing and assessment of alternatives to brominated flame retardants, as well as the dissemination of knowledge to manufacturers about the feasibility of implementing alternatives.

In the USA, the ban on brominated flame retardant penta-BDE came as a surprise to some furniture manufacturers who are now relying on the bromine industry to supply them with an alternative. The US government must do more aggressive outreach and dissemination of information on safer alternatives to balance what is being disseminated by the chemical manufacturers producing hazardous chemicals.

Implementing Safer Substitutes: the Role of Business

1. Set Aspirational Goals

Kaiser Permanente (KP) is the largest non profit health plan in the US, serving 8.2 million members. KP has launched a new chemical policy that calls for the avoidance of the use of any carcinogens, mutagens, reproductive toxins and persistent, bioaccumulative toxins. Similarly, Collins & Aikmen, a large scale carpet manufacturer, is designing products with Green Engineering criteria.

Samsung, one of the world's largest electronic companies, has publicly committed itself to establishing timetables for the phase out of PVC, organotins and all types of brominated flame retardants from all of its products worldwide by the end of 2005. It has conducted an inventory of chemical use to formulate a substitute development programme with targeted phase out dates. For new chemicals, the company will evaluate potentially hazardous environmental effects and only will use a chemical in production "if sufficient evidence is available to demonstrate that they present no irreversible hazards to ecosystems or human health."

2. Declare Chemicals and Chemical Classes as Priorities for Substitution

Leading companies in the Information Technology sector have drawn up extensive lists of chemicals for phase out with accompanying dates. For example, Sony has listed three categories of chemicals (prohibited immediately; phase-out by individually set periods; reduced use pending more research). As an example, the use of all chlorinated organic compounds are set either for immediate phase out or reduction.[12]

3. Enforce Chemical Policies on Phase Out throughout Supply Chains

Companies should have systems set up to ensure suppliers are meeting chemical restrictions. For example, Dutch authorities determined in 2001 that the peripherals of a Sony Game Boy console contained levels of cadmium above the limit allowed. To prevent similar problems from occurring and to prepare for stricter regulations, Sony carried out a systematic review of existing supply chains and internal management systems to implement stricter management procedures. See next.

4. Base Priority Decisions on Hazard Assessments, Not Risk Assessments

Substitution involves a complete change, not the risk management of problematic chemicals. The head of buying for H&M, a large retailer, states:

"H&M is applying the precautionary principle. In practice, this has meant working closely with our suppliers to phase out substances and materials that are, or could potentially be, harmful to our customers or the environment, from our products. In doing so, we have constantly, together with our suppliers, searched for less harmful solutions. We have encouraged our suppliers to be innovative and when we have found a better alternative somewhere among our suppliers we have helped to spread that knowledge to other suppliers and other markets. In doing so, we have found that almost anything is possible

as long as you set clear guidelines on what is not acceptable. We have not had to compromise on fashion or quality in a way that has harmed our business. Prices may have gone up temporarily but as soon as mass production has started, the prices have gone back to previous levels. With the background of this experience, we find it important that EU legislation supports the idea of substitution when a better alternative is available. Such legislation would support us in our continued effort to eliminate hazardous substances from our products and to find better solutions that are less harmful to the environment." [13]

5. Implement Substitution Plans

For industries with no progressive chemical policy, a full audit of chemical use must be done with prioritisation and investigation of alternatives. For retailers with their own brand name products, supply chain enforcement of safer materials must be done and publicized. Retailers with no direct control over product supply chains can still ask their suppliers about their chemical policy and work with them to implement the substitution principle. To date, thirteen retailers in the UK have signed the Retailer's pledge pledging to require that their supply chain substitute high priority chemicals with safer alternatives.[14]

6. Require Manufacturers to submit full Toxicity Data[15]

A common complaint from downstream users of chemicals is that they lack good data from their chemical suppliers. Pressure must be exerted on producers to supply full environmental and human health data that goes beyond the current inadequate Materials Safety Data Sheets.

ENDNOTES

1 Lohse, Joachim et al. op cit.

2 *http://www.miljomal.nu/english/english.php*

3 visit *http://www.miljomal.nu/english/objectives.php*

4 Partial Regulatory impact Assessment for nonylphenols, octylphenols and their ethoxylates. UK Chemicals Stakeholder Forum. DEFRA 2003.

5 Economic Instruments for the Virtual Elimination of persistent Toxic Substances in the Great Lakes Basin. IJC. December 1994

6 The Great Louisiana Tax Giveaway: $2.5 Billion—A Decade of Corporate Welfare, 1980-1989. Louisiana Coalition for Tax Justice.

7 Thorpe, Beverley. (2003) Safer Chemicals Within Reach. Greenpeace Environmental Trust UK. Also at *www.cleanproduction.org*

8 Toxic Use Reduction Institute website lists the legislation, outline of the plan procedure and results of the ten year programme. *www.turi.org*.

9 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__970aspx*

10 Lohse, J., 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.

11 DEFRA. Government Response to the Royal Commission on Environmental Pollution Report on Chemicals in Products. August 2004

12 Sony CSR Report 2004. *www.sony.net/SonyInfo/procurementinfo/*. Also see their2004 report on line at *www.sony.net/IR/*

13 Ingrid Schulstrom. H&M quoted in Thorpe, B. Safer Chemicals Within Reach. Greenpeace UK 2003.

14 Visit *www.foe.org.uk/campaigns/safer_chemicals/success_stories/retailer_action_risky_chemicals.html*

15 For more information on full toxicity data, please see Background paper No.5 of the Louisville Charter: Require Comprehensive Safety Data for All Chemicals