DIVISION OF
CORPORATION FINANCE

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

DC

04008835

February 13, 2004

Ronald O. Mueller
Gibson, Dunn & Crutcher LLP
1050 Connecticut Avenue, N.W.
Washington, DC 20036-5306

Act: 1934
Section:
Rule: 14A-8
Public
Availability: 2/13/2004

Re: The Dow Chemical Company
Incoming letter dated December 30, 2003

Dear Mr. Mueller:

This is in response to your letter dated December 30, 2003 concerning the shareholder proposal submitted to Dow Chemical by Daniel Clowes. We also have received a letter submitted on the proponent's behalf dated January 29, 2004. Our response is attached to the enclosed photocopy of your correspondence. By doing this, we avoid having to recite or summarize the facts set forth in the correspondence. Copies of all of the correspondence also will be provided to the proponent.

In connection with this matter, your attention is directed to the enclosure, which sets forth a brief discussion of the Division's informal procedures regarding shareholder proposals.

Sincerely,

Martin P. Dunn
Deputy Director

Enclosures

cc: Sanford J. Lewis
371 Moody Street #110
Waltham, MA 02453

GIBSON, DUNN & CRUTCHER LLP

LAWYERS

A REGISTERED LIMITED LIABILITY PARTNERSHIP
INCLUDING PROFESSIONAL CORPORATIONS

1050 Connecticut Avenue, N.W. Washington, D.C. 20036-5306
(202) 955-8500
www.gibsondunn.com

rmueller@gibsondunn.com

December 30, 2003

Direct Dial
(202) 955-8671
Fax No.
(202) 530-9569

Client No.
C 22013-00029

VIA HAND DELIVERY

Office of the Chief Counsel
Division of Corporation Finance
Securities and Exchange Commission
450 Fifth Street, N.W.
Washington, D.C. 20549

Re: *Stockholder Proposal of Daniel Clowes*
Securities Exchange Act of 1934 - Rule 14a-8

Dear Ladies and Gentlemen:

This letter is to inform you that it is the intention of our client, The Dow Chemical Company (the "Company"), to omit from its proxy statement and form of proxy for the Company's 2004 Annual Meeting of Stockholders (collectively, the "2004 Proxy Materials") a stockholder proposal and statement in support thereof (the "Proposal") received from Trillium Asset Management Corporation as the authorized representative of Mr. Daniel Clowes (the "Proponent"). The Proposal addresses the Company's reporting regarding certain toxic substances. Specifically, the Proposal asserts that the disclosures that the Company already provides in The Dow Global Public Report (the Company's public report on sustainable development) and in the Company's SEC filings have four "gaps" in their coverage. The Proposal describes the purported "gaps" and requests that the Company publish "a report filling the gaps in Dow Chemical transparency discussed above." The Proposal is attached hereto as Exhibit A.

On behalf of our client, we hereby notify the Division of Corporation Finance of the Company's intention to exclude the Proposal from its 2004 Proxy Materials, and we respectfully request that the staff of the Division of Corporation Finance (the "Staff") concur in our view that the Proposal is excludable, under Rule 14a-8(i)(10) because the Company has already

substantially implemented it, and under Rule 14a-8(i)(7) because the Proposal deals with matters related to the Company's ordinary business operations.[1]

Pursuant to Rule 14a-8(j), enclosed herewith are six (6) copies of this letter and its attachment. Also in accordance with Rule 14a-8(j), a copy of this letter and its attachment is being mailed on this date to the Proponent and the Proponent's representative, informing them of the Company's intention to omit the Proposal from the 2004 Proxy Materials. The Company intends to file its definitive 2004 Proxy Materials on or after March 19, 2004. Accordingly, pursuant to Rule 14a-8(j), this letter is being submitted not less than 80 days before the Company files its definitive materials and form of proxy with the Securities and Exchange Commission.

ANALYSIS

The Proposal seeks to micromanage the form and content of the Company's disclosures regarding certain specifically identified aspects of the Company's environmental initiatives. We believe that the Proposal does not address any general policy issue; instead, the Proposal ignores the broad scope and robust content of the Company's existing disclosures and seeks to micromanage those disclosures by delving into details that relate to the Company's ordinary business operation. Specifically, the Proposal asserts that the Company's existing disclosures do not adequately address the following four topics and requests that the Company provide additional information to fill these purported "gaps:"

- "How public policies may impact the company's product lines, including the Stockholm POPs treaty, Great Lakes Water Quality Agreement and the proposed European REACH program."

- "The list of Dow Chemical products anticipated to require specific authorization or be restricted under the proposed European "REACH" program."

- "A company plan and timeline for phase-out of each product involving a persistent, bioaccumulative chemical or byproduct, or an explanation of why alternatives cannot be substituted, explaining how the company will respond to rising regulatory, competitive and public pressure."

---

[1] In addition, while the Company does not agree with a number of the assertions and conclusions set forth in the Proposal, the Company has informed us that (as it did last year) it has contacted the Proponent's representatives and proposed to discuss these matters directly with the Proponent's representatives and others.

- "A listing of the reasonable range of projected costs of remediation or liability anticipated for (a) Midland, Michigan, (b) Agent Orange, and (c) each of the other potentially material toxic sites and issues facing the company."

Because the Company is already addressing these topics both in its existing public disclosures and in the conduct of its ordinary course of business, the Proposal may be excluded under Rule 14a-8(i)(10) and Rule 14a-8(i)(7).

1. The Proposal May Be Excluded under Rule 14a-8(i)(10) Because the Company Has Substantially Implemented the Proposal.

Because the Company already provides extensive disclosure on its goals to further reduce dioxins and bioaccumulative chemicals, progress toward achievement of the goals, its steps to assess the impact of various public policy initiatives and regulations on the Company's products, and its anticipated costs for remediation or liability arising from dioxin and other chemicals, the Proposal should be excluded from the 2004 Proxy Materials as moot. Through a wide variety of reports, including reports filed by the Company with various national, state and local regulatory agencies in the U.S. and around the world, the Company provides an extensive array of information regarding its activities to address a wide range of environmental initiatives.

Much of this information is published and regularly updated on the Company's extensive website devoted to Environment, Health and Safety ("EH&S") at http://www.dow.com/environment/ehs.html. In particular, the Company provides detailed information regarding its environmental policies and expenditures in The Dow Global Public Report (the most recent edition of this report published in May 2003 appears at http://www.dow.com/publicreport.2002/index.htm. Through the disclosures in The Dow Global Public Report and the EH&S section of the Company's website, particularly, a segment entitled "Debates and Dilemmas" that appears at http://www.dow.com/environment/debate.html, the Company addresses both the public policy issues and the Company's actions and/or responses to the product issues enumerated in the Proposal. The web site includes specific and substantive discussions on each of the issues listed in the Proposal.[2]

- The discussion on the Stockholm POPs Treaty is set forth at http://www.dow.com/environment/dioxin/treaty.htm. This site describes the

---

[2] Because these materials are publicly available through the Company's website, we have not included copies with this no-action letter submission. However, if the Staff would like copies of these materials, or an electronic version of this letter so that it can follow the hyperlinks, please contact the undersigned at (202) 955-8671.

Stockholm Treaty as it relates to the Company, including the fact that the majority of the substances addressed in the treaty are pesticides that are neither created nor emitted by the Company. The site also describes the Company's approach to meeting the requirements of the treaty, and provides a direct link to the official Stockholm Treaty web site. As stated elsewhere on the Debates and Dilemmas site (http://www.dow.com/environment/dioxin/index.htm), the Company actively supports the Stockholm Treaty.

- The discussion on the Great Lakes Water Quality Agreement ("GLWQA"), at http://www.dow.com/environment/debate/d12.html, discusses the agreement (with a direct link to the official GLWQA web sites in both the US and Canada), its principle areas of focus and the Company's actions in regard to the agreement.

- The discussion on the proposed European Union's Registration, Evaluation, and Authorization of Chemicals ("REACH") program is set forth at http://www.dow.com/environment/debate/d13.html. This site describes the Company's understanding and analysis of, and position on, the proposed regulatory requirements of REACH, explaining that REACH has not been formally adopted so that rules and protocols are not yet developed. The site provides a direct link to the European Union's official REACH web site for current information. The Dow Global Public Report 2002 also states that the Company is continuing to assess the impact of various new regulatory requirements, including the European "REACH" program.

- The Company's EH&S web site describes the Company's position on the virtual elimination of by-product POPs associated with the manufacturing of the Company's products. Further, the Company states that it is committed to reducing dioxins by 90 percent by the year 2005, that it has spent more than $500 million on improvements to processes and treatment technologies to reduce generation and emission of dioxins, and that so far it has reduced emissions by 75 percent. Additional information is available at *Dow's Commitment to Dioxin Reduction, at* http://www.dow.com/environment/dioxin/index.htm.

- The Dow Global Public Report 2002, at pages 21-22, provides information about the Company's commitment to the phase-out of priority compounds including bioaccumulative chemicals and byproducts. The Company states that its goal is to reduce the emission of priority compounds by 75%, and that since 1994 the Company has reduced emissions of priority compounds by 81%.

- The discussion on environmental remediation and potential future liabilities for remediation is found at http://www.dow.com/environment/debate/d11.html. This site

discusses both the current amount accrued by the Company for remediation and provides a direct link to the Company's web site for access to its SEC submissions.

- There is also a discussion of the Agent Orange issue at http://www.dow.com/environment/debate/d10.html. This site describes both the historical and current Dow perspective on this issue.

- *See also* The Dow Global Public Report 2002, page 23, http://www.dow.com/publicreport/2002/pdfs/233-00207.pdf, where the Company further discloses its capital spending on environmental, health and safety matters. *Id.*

We believe that the foregoing disclosures respond to each area of business conduct raised in the Proposal and therefore substantially implement the Proposal. Rule 14a-8(i)(10) permits exclusion of a stockholder proposal "if the company has already substantially implemented the proposal." According to the Commission, the exclusion provided in Rule 14a-8(i)(10) "is designed to avoid the possibility of shareholders having to consider matters which have already been favorably acted upon by the management." *See* Exchange Act Release No. 12598 (July 7, 1976).

When a company can demonstrate that it already has taken actions to address each element of a stockholder proposal, the Staff has concurred that the proposal has been "substantially implemented" and may be excluded as moot. *See, e.g.,* Exxon Mobil Corporation (avail. Jan. 24, 2001) (proposal that board conduct a review of a project and report on its results substantially implemented by prior corporate disclosures); Nordstrom, Inc. (avail. Feb. 8, 1995) (proposal that the company commit to a code of conduct for its overseas suppliers that was substantially covered by existing company guidelines was excludable as moot). *See also* The Gap, Inc. (avail. Mar. 8, 1996).

We believe that the disclosures described above and maintained on the Company's website, when compared to the disclosure items that the Proposal specifically addresses, demonstrate that the Company has substantially implemented the Proposal in The Dow Global Public Report and other public disclosures. The fact that the Company's disclosures may not appear in a single report as requested by the Proponent or may not provide as extensive detail as the Proponent would prefer does not mean that the Company has failed to substantially implement the Proposal. Exxon Mobil Corporation (avail. Jan. 24, 2001); E. I. Du Pont de Nemours and Company (avail. Feb. 14, 1995); The Boeing Company (avail. Feb. 7, 1994); Houston Industries Inc. (avail. Apr. 21, 1988); Houston Industries Inc. (avail. Apr. 10, 1987). Accordingly, we believe that the Proposal may be excluded under Rule 14a-8(i)(10).

2. The Proposal May Be Excluded in Its Entirety under Rule 14a-8(i)(7) Because the Proposal Deals with Matters Relating to the Company's Ordinary Business Operations (i.e., Involvement in the Political or Legislative Process and the Assessment of Risks).

Certain of the "gaps" that the Proponent alleges exist in the Company's public disclosures do not involve broad policy issues but instead relate to details of how the Company manages its day-to-day business. In particular, the Proposal seeks information on the possible impact of various prospective legislative and regulatory initiatives and an assessment of certain risks facing the Company. The Staff consistently has concurred that proposals seeking reports on a company's handling of or assessment of legislative, policy and/or regulatory actions are ordinary business matters.[3] Accordingly, the Proposal properly may be omitted from the 2004 Proxy Materials pursuant to Rule 14a-8(i)(7) because the Proposal is not limited to significant policy issues but instead seeks disclosure of matters relating to the Company's ordinary business operations.

The Proposal requests information on "How public policies may impact the company's product lines, including the Stockholm POPs treaty, Great Lakes Water Quality Agreement and the proposed European REACH program," and on "The list of Dow Chemical products anticipated to require specific authorization or be restricted under the proposed European 'REACH' program." The Staff has frequently concurred that proposals seeking reports on the

---

[3] Even if some of the alleged "gaps" in disclosure do not relate to ordinary business matters, the Staff has consistently held that a proposal calling for a report that addresses a number of different items can be excluded if any part of the proposed disclosures relate to a company's ordinary business. *See* Release No. 34-20091 (Aug. 16, 1983). For example, in Chrysler Corporation (avail. Feb. 18, 1998), the proposal requested the company to initiate a review of the company's code or standards for its international operations and issue a report thereon. The Staff agreed that the proposal could be excluded under Rule 14a-8(i)(7), stating "although the balance of the proposal and supporting statement appears to address matters outside the course of ordinary business, paragraph 5 of the resolution relates to ordinary business matters, and paragraph 6 is susceptible to a variety of interpretations, some of which could involve ordinary business matters." Likewise, the Staff recently confirmed that "where the subject matter of the additional disclosure sought in a particular proposal involves a matter of ordinary business ... it may be excluded under Rule 14a-8(i)(7)." Johnson Controls, Inc. (avail. Oct. 26, 1999). In accordance with all the precedents cited herein, the Company should be permitted to exclude the entire Proposal from its 2004 Proxy Materials because it calls, at least in part, for a report on matters related to the Company's ordinary business operations in contravention of Rule 14a-8(i)(7).

impact to a company of regulations or legislation being considered by national (or in this case, international or multi-national) policy makers may be excluded because they seek to involve the company in the political or legislative process relating to an aspect of the company's operations.

For example, in International Business Machines Corporation (avail. Mar. 2, 2000) the proposal asked the company to prepare "a report on the potential impact on IBM of pension-related proposals now being considered by national policy makers, including legislative proposals affecting cash balance pension plan conversions and related issues." Noting that the proposal "appears directed at involving IBM in the political or legislative process relating to an aspect of IBM's operations," the Staff concurred that the company could rely on Rule 14a-8(i)(7) to exclude the proposal. *See also* Electronic Data Systems Corporation (avail. Mar. 24, 2000) and Niagara Mohawk Holdings, Inc. (avail. Mar. 5, 2001) (both seeking reports evaluating the impact of legislative and regulatory actions of pension-related proposals). In Brown Group, Inc. (avail. Mar. 29, 1993), the Staff concurred that the company could exclude a proposal requesting the board of directors to establish a committee that would evaluate and report on the impact of various health care reform proposals because the proposal appeared to be "directed at involving the Brown Group in the political or legislative process relating to an aspect of the Brown Group's operations." In Northern States Power Company (avail. Mar. 14, 1997), the Staff concurred that a proposal asking the company to take an active public stance on regulatory reform in the utility industry was excludable as "involving the Company in the political or legislative process that relates to aspects of the Company's operation." More recently, in International Business Machines Corporation (avail. Jan 21, 2002), the Staff agreed that a proposal requesting a report on the cost to the company of health care benefits "appears directed at involving IBM in the political or legislative process relating to an aspect of IBM's operations," and therefore could be excluded under Rule 14a-8(i)(7).[4]

---

[4] In this respect, the Proposal is also similar to numerous other proposals that the Staff has concluded related to the costs and other implications to a company's operations of compliance with governmental statutes and regulations and therefore are excludable pursuant to Rule 14a-8(i)(7). In Duke Power Company (avail. Feb. 1, 1988), for example, the Staff concurred that a proposal requiring an annual report detailing Duke Power's environmental protection and pollution control activities could be omitted from its proxy statement on Rule 14a-8(i)(7) grounds because compliance with government environmental regulations was considered part of Duke Power's ordinary business operations. Likewise, in Carolina Power and Light Company (avail. Mar. 30, 1988), the Staff concurred that a report on the company's environmental protection and pollution control activities was excludable because it related o the conduct of the Company's ordinary business activities. This conclusion has been reached even when the subject matter of the report in question related to legal

[Footnote continued on next page]

The Proposal also requests "A listing of the reasonable range of projected costs of remediation or liability anticipated for (a) Midland, Michigan, (b) Agent Orange, and (c) each of the other potentially material toxic sites and issues facing the company." The information sought goes to the Company's assessment of the risks it faces from the conduct of its business. Again, it is well established that proposals seeking detailed information on a company's assessment of risks arising from its business operations goes beyond raising policy issues and instead delves into the minutiae and details of the ordinary conduct of business. In this respect, the proposal is very similar to the one addressed in Xcel Energy, Inc. (avail. Apr. 1, 2003). That proposal requested the company to issue a report on (a) the economic risk associated with the Company's past, present, and future emissions of carbon dioxide, sulfur dioxide, nitrogen oxide and mercury emissions, and the public stance of the company regarding efforts to reduce these emissions, and (b) the economic benefits of committing to a substantial reduction of those emissions related to its current business activities. The Staff concurred that the proposal could be excluded under Rule 14a-8(i)(7) because it related to the evaluation of risks from the company's operations. *See* Cynergy Corp. (avail. Feb. 5, 2003) (same proposal). *See also* The Mead Corporation (avail. Jan. 31, 2001) (excluding proposal related to a request for an economic or financial report of the company's environmental risks). Likewise, in Williamette Industries (avail. Mar. 20, 2001), the proposal requested a report on the company's "environmental problems and efforts to resolve them," including an assessment of "worst case" financial liability over the following 10 years and "the major challenges at Willamette facilities to comply with environmental regulations." Consistent with the foregoing precedent, the Staff concurred that the company could exclude the proposal under Rule 14a-8(i)(7) because it involved "ordinary business operations (i.e., evaluation of risk)."

As in the foregoing examples, the Proposal here goes beyond significant policy issues and seeks to micromanage the company by delving into the details of the Company's ordinary business operations by calling for a report on the Company's assessment of pending legislative and regulatory initiatives and an assessment of risks and financial exposure of the Company. As such, we believe that the Proposal may be excluded under Rule 14a-8(i)(7).

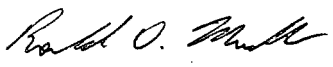
***

[Footnote continued from previous page]

compliance issues. For example, in Allstate Corporation (avail. Feb. 16, 1999), despite the subject matter of the report, the Staff concluded that the proposal did not raise significant policy considerations and did relate to Allstate's ordinary business activities even though the proposal concerned the creation of an independent committee to prepare a report on alleged illegal activity by Allstate, other state actions against Allstate, and recommendations to control costs of actions.

We would be happy to provide you with any additional information and answer any questions that you may have regarding this subject. Should you disagree with the conclusions set forth in this letter, we respectfully request the opportunity to confer with you prior to the determination of the Staff's final position. Please do not hesitate to call me at (202) 955-8671, or the Company's Corporate Secretary, Tina S. Van Dam, at (989) 636-2663, if we can be of any further assistance in this matter.

Sincerely,



Ronald O. Mueller

Attachment

cc: Tina S. Van Dam, Corporate Secretary, The Dow Chemical Company
Daniel Clowes, Proponent
Shelley Alpern, Assistant Vice President, Trillium Asset Management Corporation

70269909_5.DOC

EXHIBIT A

Shelley Alpern
Director of Social Research & Advocacy
Trillium Asset Management Corp.
711 Atlantic Avenue
Boston, MA 02111

Dear Ms. Alpern:

I hereby authorize Trillium Asset Management Corporation to file a shareholder resolution on my behalf at Dow Chemical.

I am the beneficial owner of 1,200 shares of Dow Chemical common stock that I have held for more than one year. I intend to hold the aforementioned shares through the date of the company's annual meeting in 2004.

I specifically give Trillium Asset Management Corporation full authority to deal, on my behalf, with any and all aspects of the aforementioned shareholder resolution. I understand that my name may appear on the corporation's proxy statement as the filer of the aforementioned resolution.

Sincerely,

Daniel Lowes

c/o Trillium Asset Management Corporation
711 Atlantic Avenue, Boston, MA 02111

November 21, 2003
Date

Investing for a Better World

www.trilliuminvest.com

November 25, 2003

Mrs. Tina S. Van Dam
Corporate Secretary
The Dow Chemical Company
2030 Dow Center
Midland, MI 48674

Via fax (989-636-5832) and regular mail

Dear Mrs. Van Dam:

I am authorized to notify you of our intention to present the enclosed proposal for consideration and action by the stockholders at the next annual meeting. TRILLIUM ASSET MANAGEMENT submits the resolution for inclusion in the 2003 proxy statement in accordance with Rule 14a-8 of the General Rules and Regulations of the Securities and Exchange Act of 1934.

TRILLIUM ASSET MANAGEMENT is investment advisor to the Mr. Daniel Clowes, who is beneficial owner of 1,200 shares of Dow Chemical common stock acquired more than one year prior to this date. Enclosed is a letter from Mr. Clowes authorizing Trillium Asset Management to represent him in this matter. Verification of ownership will also be forwarded shortly.

Sincerely,

Shelley Alpern
Assistant Vice President
Trillium Asset Management

cc: William Stavropoulos, Chairman and CEO, Dow Chemical
Samuel L. Smolik, Vice President, Environment, Health and Safety, Dow Chemical

Boston
Durham
San Francisco
Boise

Trillium Asset Management Corporation
711 Atlantic Avenue • Boston Massachusetts 02111-2809
tel 617-423-6655 *fax* 617-482-6179 *toll-free* 800-548-5684

Report Regarding Certain Toxic Substances

Whereas:

Concerns about chemical hazards are growing. Increased monitoring is demonstrating widespread exposure from current and past practices. In the opinion of the proponents, related policy proposals and litigation will also grow, with implications for Dow.

New technologies of analysis make it possible to detect chemicals such as dioxin and pesticides in the bodies of people, even at low levels, and to identify trends in chemical exposures. Among these are compounds found in Dow products, such as Dursban. The testing may aid the correlation of exposure to disease, and liability suits against chemical producers.

Dow's Midland, Michigan manufacturing facility releases dioxin to air, land and water. The surrounding city and watershed are contaminated with dioxin, with levels detected in the floodplain downriver as high as 80 times the state's residential cleanup standard. A state advisory has warned that exposure to the contaminated soil could pose a health hazard. A class action lawsuit on behalf of as many as 2000 residents asserts property damages and seeks medical monitoring.

Agent Orange, a Viet Nam era pesticide, was contaminated with dioxins. US and Vietnamese veterans and their families are demanding compensation from Dow. A 2003 US Supreme Court decision may allow thousands of new US veterans' suits to proceed.

Emerging public policies may require changes in production and use of certain Dow product lines. For example, the European Union proposes requiring manufacturers that sell chemicals in Europe to provide data on hazards and uses, and would require special approval of certain "very high concern" chemicals, including some persistent and bioaccumulative toxics, carcinogens, mutagens and reproductive toxins. The Stockholm Treaty on Persistent Organic Pollutants and the Great Lakes Water Quality Agreement both encourage elimination of persistent toxic chemical products and precursors.

In the opinion of the proponents, management's sustainability report and SEC filings obscure rather than clarify some of the most important policy issues confronting Dow, because they leave gaps in disclosure, specifically:

- How public policies may impact the company's product lines, including the Stockholm POPs treaty, Great Lakes Water Quality Agreement and the proposed European REACH program.

- The list of Dow Chemical products anticipated to require specific authorization or be restricted under the proposed European "REACH" program.

- A company plan and timeline for phase-out of each product involving a persistent, bioaccumulative chemical or byproduct, or an explanation of why alternatives cannot be substituted, explaining how the company will respond to rising regulatory, competitive and public pressure.

- A listing of the reasonable range of projected costs of remediation or liability anticipated for (a) Midland, Michigan, (b) Agent Orange, and (c) each of the other potentially material toxic sites and issues facing the company.

RESOLVED: Shareholders request that the Board publish by October 2004, at reasonable cost and excluding confidential information, a report filling the gaps in Dow Chemical transparency discussed above.

SANFORD J. LEWIS, ATTORNEY

January 29, 2004

Office of the Chief Counsel
Division of Corporation Finance
Securities and Exchange Commission
450 Fifth St., N.W.
Washington, D.C. 20549

Re: Shareholder Proposal Submitted to Dow Chemical Corporation
On Behalf of Daniel Clowes (Report Regarding Certain Toxic Substances)

Dear Sir/Madam:

Daniel Clowes (the proponent) is a beneficial owner of common stock of Dow Chemical Corporation who has submitted a shareholder proposal to Dow Chemical Corporation (the company) through his representative, Trillium Asset Management Corporation. I have been asked by the proponent to respond to the letter dated December 30, 2003, sent to the Securities and Exchange Commission by Gibson, Dunn & Crutcher, LLP, on behalf of the company. In that letter, the Dow Chemical Company contends that the proponent's shareholder proposal may be excluded from the company's 2004 proxy statement by virtue of rules 14a-8(i)(7) and substantially 14a-8(i)(10).

I have reviewed the Proponent's shareholder proposal, as well as the letter sent by the company, and based upon the foregoing, as well as the relevant rules, it is my opinion that the Proponent's shareholder proposal must be included in Dow Chemical's 2004 proxy statement and that it is not excludable by virtue of those rules.

BACKGROUND

The proponent's shareholder proposal pertains to the company's broad policies on the use and production of chemicals which persist in the environment, and build up in living things - persistent bioaccumulative pollutants - including dioxins. This relatively small group of compounds is under heightened scrutiny by international, federal, state and local policymakers, who have been targeting many of them for elimination.

Because the company's choice of products arguably makes it one of the world's leading producers of products that can be linked to formation and emission of persistent bioaccumulative substances at some point during their life cycle, the trends calling for elimination or strict authorization of these compounds pose a major public policy and marketplace challenge to the company.

This shareholder resolution is in essence an update and refiling of the resolution filed last year regarding Dow Chemical's toxic chemical management issues. Last year, the Staff rejected the ordinary business argument advanced by the company. Dow Chemical (March 7, 2003). Last year's resolution, filed by the same lead filer as the present resolution, sought a report

371 Moody St. #110 Waltham, MA 02453 • gnproject@earthlink.net
781 894-0709 ph. • 781 207-7895 fax

summarizing the company's plans to remediate existing dioxin contamination sites and to phase out products and processes leading to emissions of persistent organic pollutants and dioxins. In the supporting statement it was stated that shareholders believe that such report should include:

* A list of current and future Dow Chemical products and waste treatment facilities creating or emitting dioxin or PBT's at any point in their life cycle.
* Timetables and benchmarks to meet phase-out goals of the treaties.
* Annual expenditures for each year from 1995-2002 summarizing funds spent on attorney's fees, expert fees, lobbying, and public relations/media expenses relating to the potential health and environmental consequences of dioxin releases or exposures at all Dow sites, as well as actual expenditures on remediation of dioxin contaminated sites.
* A list of the company's major reservoir sources of dioxin (concentrated deposits in the environment which may disperse into the ambient environment) at Dow-owned facilities in the US and globally.
* A description of any major controversies involving community and environmental stakeholders concerning the remediation of particular sites including Michigan, and reasonable projections of any material liabilities for cleanup or otherwise related to the contamination.

Dow argued last year that the resolution delved into ordinary business and was therefore excludible due to the level of scrutiny into timing of activities, spending levels of lobbying and litigation, and because it asked for a detailed list of items including controversies, material liabilities, etc. SEC staff rejected the company's argument, stating that it could not concur that the resolution could be excluded as ordinary business. The resolution garnered the support of shareholders holding 6.9% of shares.

In the succeeding year, there have been a number of public policy and judicial developments affecting Dow's management of the toxic substances in question. As a result, proponents updated the resolution to reflect those developments.

• In 2003, the company was immersed in some very large controversies concerning specific products and sites. For instance, in 2003 the US Supreme Court opened the door to a new round of lawsuits by Viet Nam veterans and their families due to exposures related to the herbicide produced by Dow and other companies, Agent Orange. Also in 2003, the controversy surrounding the contamination of at least 22 miles downstream of Dow's headquarters with dioxin heated up further. The state of Michigan rejected the company's proposed slow timeline for study of the region, commissioned a study showing serious threats to wildlife in the region, and also warned residents to avoid contact with the contaminated soil. Pilot residential sampling conducted thus far has shown elevated levels of dioxin in the yards tested. There are an estimated 2,000 properties in the floodplain. In addition, the state is poised to begin a pilot sample of blood from residents in the contaminated area to determine if they have elevated levels of the contaminant in their bodies.

• Dow Chemical is the world's leading producer of vinyl chloride monomers, one of two key building blocks in the production of PVC plastics. PVC has come under fire as a 'worst in class plastic" for many reasons, including its link to persistent bioaccumulative toxicants. A report published by the Global Development and Environment Institute at Tufts University in December 2003 reviewed the economics of alternatives to PVC as well as the array of environmental policies being adopted by various governments and institutions to encourage that shift. The report notes widespread action to move away from PVC around the world. The report also found that less toxic alternatives are successfully competing with PVC in many applications and markets. It also concluded that a PVC phase-out is now "achievable and affordable." Excerpts of the Tufts University study are included in Appendix 2. **Though a PVC phase-out may be achievable on a societal basis, and the advocacy for such phase-out is mounting primarily due to dioxin-generation concerns, the impacts on Dow and its shareholders may be substantial.**

• Also in 2003 the European Union, through the European Commission, proposed a new Europe-wide chemical regulation program, known as REACH. REACH stands for Registration, Evaluation, and Authorization of Chemicals. Registration requires companies to provide data on their products including toxicity and information about how humans or the environment might be exposed to them. This will place the responsibility and cost for information about the industry's products on the industry. Evaluation will be required for chemicals produced in large amounts or chemicals that are especially toxic. One consequence of evaluation might be to ban certain uses of a chemical. The most toxic chemicals would require authorization. These chemicals could include carcinogens, mutagens, reproductive toxicants, and chemicals that persist and accumulate in the environment. As currently written, one potential outcome of the authorization requirement can be an outright ban on a chemical in favor of a safer alternative.

The focus of policy instruments at every level is increasingly on giving priority to the *elimination of production* of persistent bioaccumulative substances, because policymakers have concluded that as long as these products are marketed, they will eventually enter and pollute the environment either as products, as byproducts of their production, or in the form of pollutants that result from disposal of the products. Therefore, several of the products that the Company is producing are likely to be impacted by the groundswell of policy seeking phase-outs of problematic products.

The company, however, is focusing on controlling dioxins emitted from its facilities, rather than moving away from toxic-generating product lines such as vinyl chloride. As a result, the proponents believe that the company may be on a collision course with public policy – failing to change its product lines to track the emerging direction of public policy.

As a result, the proponent has revised and refiled the proposal, this time asking the management to issue a report filling gaps in its reporting, specifically:

- How public policies may impact the company's product lines, including the Stockholm POPs treaty, Great Lakes Water Quality Agreement and the proposed European REACH program.

- The list of Dow Chemical products anticipated to require specific authorization or be restricted under the proposed European "REACH" program.

- A company plan and timeline for phase-out of each product involving a persistent, bioaccumulative chemical or byproduct, or an explanation of why alternatives cannot be substituted, explaining how the company will respond to rising regulatory, competitive and public pressure.

- A listing of the reasonable range of projected costs of remediation or liability anticipated for (a) Midland, Michigan, (b) Agent Orange, and (c) each of the other potentially material toxic sites and issues facing the company.

Dow Chemical, through its attorneys, asserts first that the resolution has been substantially implemented. Secondly, the company asserts once again that the resolution relates to ordinary business. Proponents strongly disagree with the company, and provide our analysis below.

ANALYSIS

I. The actions requested in the resolution have not been substantially implemented by Dow Chemical Management.

Dow claims, first, that its publications, principally on its web pages, "substantially implement" the reporting requested by the proposal. The company has published vague but colorful web pages that mention some of the issues in the resolution. But to determine "substantial implementation" one must ask whether the core concerns of shareholders raised by the resolution have been reasonably and substantively addressed by the company. Proponents assert that those concerns have not been effectively addressed, and further, that several of the statements on the Dow website are actually materially misleading to investors and others who visit the site for information.

In the following analysis we will walk through each of the items listed by Dow and show why the company's web activities do not fill the informational gaps targeted by the shareholder resolution. On the pages following, we examine in more depth the websites listed by Dow Chemical's attorneys, to assess the extent of responsiveness to the disclosure gaps highlighted by the resolution.

In our view, the company has not substantially implemented the proposal for two separate reasons:

- First, it has not provided the substantive information requested by the proposal.

- Secondly, we believe the information that the company does provide is often materially misleading. Publication of information that may itself pose violations of SEC rules 14a-9 and 10(b)(5) because it is materially misleading cannot, in our opinion, be a substantial fulfillment of a shareholder resolution requesting disclosure on major public policy issues by the company.

DOW CHEMICAL REPORTING ASSESSED A SUMMARY ASSESSMENT OF THE STATUS OF DOW'S IMPLEMENTATION OF SHAREHOLDER INFORMATION NEEDS IDENTIFIED IN THE RESOLUTION	
REPORTING GAP	**DOES THE COMPANY SUBSTANTIALLY FILL THE GAP?**
• How public policies may impact the company's product lines, including the Stockholm POPs treaty, Great Lakes Water Quality Agreement and the proposed European REACH program.	NOT SUBSTANTIVELY. Company reporting is vague and misleading. It mischaracterizes or distorts all three of the listed public policies so as to mislead readers into believing that Dow practices are responsive – by focusing on emissions reduction, and giving no recognition to the public policies geared toward elimination of key contaminants that would require a phase out of Dow products. In addition, it fails to identify the product lines at stake, either as specific lists or as categories of products.
• The list of Dow Chemical products anticipated to require specific authorization or be restricted under the proposed European "REACH" program.	NOT AT ALL. The company does not list which of its products are slated to be targeted by the current version of the REACH proposal even though the proposal could impact some core items in its product lines.
• A company plan and timeline for phase-out of each product involving a persistent, bioaccumulative chemical or byproduct, or an explanation of why alternatives cannot be substituted, explaining how the company will respond to rising regulatory, competitive and public pressure.	NOT SUBSTANTIVELY. The company has not produced a plan or timeline for phase-out of any of the target products. It has not explained why those products cannot be subject to substitution. However, by implication from what it has written, one may conclude that it intends to resist regulatory, competitive and public pressures until it is forced to change its product lines.
• A listing of the reasonable range of projected costs of remediation or liability anticipated for (a) Midland, Michigan, (b) Agent Orange, and (c) each of the other potentially material toxic sites and issues facing the company.	NOT AT ALL. The company has not published any range of estimates of costs of remediation or liability associated with Midland, nor liability associated with new Agent Orange cases. It has not listed these or other sites or issues as potentially material.

A. Persistent Organic Pollutants/Stockholm Convention on Persistent Organic Pollutants

The Dow Chemical web page on Persistent Organic Pollutants and the Stockholm Convention Treaty[1] acknowledges the growing public policy attention to these pollutants. However, thereafter it describes the issues in a way that is quite misleading.

While the management is entitled to report that its focus has been and continues to be on reducing emissions of these products, it fails to provide a reasoned appraisal as to whether such an approach is responsive to the Treaty, and most importantly, what the impact will be on the company if it continues to hew to this strategy.

The web page noticeably fails to note that public policy is pointing towards product phaseouts! It even notes quite misleadingly "Some might argue that the generation of unwanted byproducts should be the signal that we should no longer make particular materials." This highly misleading statement neglects to note that the very treaty that they are referencing contains an Article 5 and an Annex C that provide specific provisions aimed at minimizing, and where feasible, eliminating all release of dioxins and certain other unintentionally produced persistent organic pollutants (furans, PCBs and hexachlorobenzene). Article 5 states that Each Party shall at a minimum ...(paragraph c) "Promote the development and where it deems appropriate, require the use of substitute or modified materials, products and processes to prevent the formation and release of chemicals listed ..."

The Stockholm Convention also (in Annex C, part V, section A) states that "Priority should be given to the consideration of approaches to prevent the formation and release of the chemicals listed ... Useful measures could include:"(paragraph d) "Replacement of feed materials which are persistent organic pollutants or where there is a direct link between the materials and the release of persistent organic pollutants from the source."

There has been a scientific and policy debate for more than a decade on whether or not a "direct link" can be demonstrated between dioxin releases and the production and disposal of chlorinated organic chemicals and materials. In North America, this debate was first seriously engaged in the early 1990's when the International Joint Commission on the Great Lakes (IJC) first reached this conclusion in its Sixth Biennial Report (March 1992). Given that the Stockholm Convention is a more global policy instrument than is the Great Lakes Water Quality Agreement (from which the IJC derives its relevant Terms of Reference), one must assume that this debate will gain momentum in coming years in the context of the implementation of this global, legally binding instrument. The outcome of this public policy debate could substantially effect the longer-term viability of many Dow products and sunk capital investments.

The focus of policy instruments at every level is increasingly on giving priority to the *elimination of production* of persistent bioaccumulative substances, because policymakers have concluded that as long as these products are marketed, they will eventually enter and pollute the environment through products and disposal pathways. Therefore, several of the

[1] http://www.dow.com/environment/dioxin/treaty.htm

products that the Company is producing are not only targeted by public policy for emissions reduction at the site of production but they are also targeted for phase-outs of product sales and distribution. The International Joint Commission, in implementing the Great Lakes Water Quality Agreement, has repeatedly called for a phase-out of production and products that lead to persistent bioaccumulative compounds, especially chlorine products.

Partly in response to the POPs treaty and the IJC's recommendation, numerous communities and states have adopted resolutions or laws seeking to end the purchase or production of dioxin-generating products. In addition, institutional purchasers are also moving away from such products.

For example, quite a few institutions have begun to move away from PVC plastic because of its link to the potential for dioxin formation, among other reasons (Dow is a major manufacturer of the feedstocks for PVC plastic). There is a growing trend away from PVC purchasing worldwide. See Appendix 2 for examples cited in the Tufts University study.

In addition, a number of states and localities have begun adopting policies generally relating to dioxins and/or PBTs. For example, Oregon Executive Order NO. EO-99-13 charges the Oregon Department of Environment Quality to lead a statewide effort to eliminate the release of PBTs into the environment, and among other things utilize education, technical assistance, pollution prevention, economic incentives, government procurement policies, compliance, and permitting activities to eliminate PBTs.

The EPA and the American Hospital Association signed an MOU committing the nation's hospitals to the reduction of PBT's. Several of the largest healthcare institutions and the purchasing organizations that supply them have articulated policies to prefer non-PVC products. They are leading efforts in other industry sectors to move away from PVC because of the products' link to PBTs.

On October 29, 2003 the Boston City Council unanimously passed a Dioxin Resolution, calling for the City Council to encourage "elimination of dioxin emissions through its procurement practices wherever possible." The Council is working with the Purchasing Department to create a framework for substituting alternatives to dioxin emitting products whenever economically feasible.

Dow's reports state that the reason Dow has chosen to focus its efforts on dioxin emissions to air and water (from Dow ***facilities***) in goal setting is because these emissions "ultimately end up in the environment." This is a distortion of the actual situation, which is that quite a lot of dioxins end up in the environment as a result of the use and disposal of Dow ***products***. The planned reductions do not take into account real world use of Dow products. Dioxin and other PBT's are unavoidably produced during production, and unavoidably produced during both burning or controlled incineration. Increasingly, dioxin formation is being attributed to the uncontrolled burning of plastics (notably PVC, for which the basic building blocks are manufactured by Dow). Backyard burning, or the uncontrolled burning of household waste, has recently been estimated to contribute more than 800 grams of dioxin to the national

inventory according to an EPA official quoted in Science News. That is a substantial portion of the national total of 3,000 grams from all sources. In addition, unquantified but likely large additional sources include landfill fires, house fires and car fires. All contain products manufactured with Dow feedstocks, all are uncontrolled and will not be controlled, and all are efficient producers of dioxin.

The Dow website states: "Dow currently has no specific reduction goals for landfill disposal of dioxins... Conversely, Dow uses specially designed hazardous waste landfills for dioxin disposal where there is no potential for release to the environment."

Although the company may not be setting goals for dioxins it loads into landfills, landfills provide a reservoir for dioxins that may hold future liabilities for Dow. First, landfills leak, representing a high potential for environmental releases.[2] Second, landfill fires provide a demonstrated dioxin source. Finally, the Stockholm Convention seeks to eliminate all dioxin releases to all media.

Uncontrolled burning in developing countries is far more widespread, and the scale of such burning dwarfs US numbers. Reliable statistics are not available, but the lack of basic infrastructure for waste handling leads to major uncontrolled burning in many of the countries that are both major growth markets for Dow, and signatories to the Stockholm Convention. Reduction efforts for these sources will unavoidably be focused on changing the materials used in basic consumer products.

Dow Chemical states that "in managing risk, we consider everything from byproduct minimization and emissions reduction, to elimination of those products or uses that poses a significant risk to human health and the environment." The fact that they "consider" the options is interesting in light of the apparently very little actual phase-out of particular products using this rationale. **The resolution asks Dow to go beyond this, however, to either provide a timetable for phaseouts, or explain why they are not phasing out the toxic products and replacing them with safer alternatives. Dow has done nothing in its reporting to respond substantively to that request.**

B. Great Lakes Water Quality Agreement

The Dow Chemical web page discussing the Great Lakes Water Quality Agreement (GLWQA)[3] notes that the GLWQA has a **goal of "virtual elimination"** of persistent toxic substances. The company then goes on to say that Dow Chemical is **"supportive of emission reduction programs"** for persistent toxic substances as part of the bi-national toxics strategy. The placement of these two statements in this sequence is highly misleading to visitors to this Dow web site, including shareholders, because it fails to note that the policies adopted under the Great Lakes Water Quality Agreement by the International Joint Commission to implement the goal of virtual elimination **includes the elimination of certain Dow products**

[2] See http://www.ejnet.org/landfills/ and http://www.ejnet.org/rachel/rhwn116.htm and http://www.ejnet.org/rachel/rhwn117.htm.
[3] www.dow.com/environment/debate/d12.html

– not just Dow emissions. In 1992 and again in 1994, the International Joint Commission (IJC) on the Great Lakes recommended that the United States and Canada develop a timetable to **sunset the use of chlorine and chlorine-containing compounds in industrial feedstocks**. The IJC recommendation was based on their reading of the Great Lakes Water Quality Agreement. [4]

Thus, while the company points to its efforts to reduce the production and release of byproduct chemicals, it fails to assess or apprise the reader of the impact of the emerging policies seeking to **eliminate or alter Dow Chemical products themselves**.

C. Impacts of Proposed European REACH Program

The Dow Chemical web page on the European REACH program,[5] vaguely mentions that:

- the company and the European Chemical Industry Association are engaged in advocacy efforts, to attempt to soften the impact of the proposed program.
- prudence dictates that (unnamed) preparations be undertaken within Dow to eventually implement the requirements of the program.
- the company anticipates increased (but unquantified) costs for product testing, risk characterization, and preparation of reports under the REACH program.
- some Dow products may be subject to the EU authorization process,
- Dow believes it will be able to demonstrate adequate risk management for the use and application of the majority of such substances.

It would be impossible for shareholders visiting the Dow site to assess how impactful the

---

[4] The Seventh Biennial Report on Great Lakes Water Quality issued by the International Joint Commission pursuant to the US-Canada Great Lakes Water Quality Agreement, addressed the topic of why persistent toxic substances such as dioxin cannot be safely regulated and must be phased out.

> The idea of a non-zero assimilative capacity in the environment or in our bodies (and hence allowable discharges) for such chemicals is no longer relevant. The Great Lakes Water Quality Board supports this view, concluding that there is no acceptable assimilative capacity for persistent, bioaccumulative toxic substances. It states, therefore, that the only appropriate water quality objective is zero....
>
> Within the environment's carrying capacity for human activity, there is no space for human loadings of persistent toxic substances. Hence, there can be no acceptable loading of chemicals that accumulate for very long periods, except that which nature itself generates. Moreover, conventional scientific concepts of dose-response and acceptable risk can no longer be defined as good scientific and management bases for defining acceptable levels of pollution. They are outmoded and inappropriate ways of thinking about persistent toxics...
>
> The production and release of these substances into the environment must, therefore, be considered contrary to the agreement legally, unsupportable ecologically and dangerous to health generally. Above all, it is ethically and morally unacceptable. The limits on allowable quantities of these substances entering the environment must be effectively zero, and the primary means to achieve zero should be the prevention of their production, use and release rather than their subsequent removal. International Joint Commission, *7th Biennial Report*, 1994.

[5] www.dow.com/environment/debate/d13.html

pending REACH program may be on the company. According to Dow's reporting to shareholders, 33% of 2002 revenues were derived from Europe, and 31% of revenues from its Chemicals and Performance Chemicals businesses.6 The likely adoption of REACH presents a clear challenge to its business strategy worldwide.

The proposed authorization process focuses on carcinogens, mutagens, substances toxic to reproduction, and persistent organic pollutants and has the potential to prohibit the use of chemical. These properties are well-represented in Dow's product lineup. The proponent believes that shareholders have the right to know which chemicals might be impacted (i.e. exported to the EU), current sales to the EU of these products, and potential financial impact on the company. Dow glosses over this by implying that few, if any, of their products will be constrained by EU authorization requirements.

The website misleadingly implies that demonstrating "adequate risk management" will allow Dow products to persevere through the proposed EU system to authorization.

"Some Dow products may be subject to the authorization process under EU REACH, but it is expected that Dow will be able to demonstrate adequate risk management for the use and application of the majority of such substances."

This outcome may be contingent on Dow and the European Chemical Industry Association persuading the European parliament to modify the current proposal so that a company's "risk management" is adequate for the use, application and disposal of substances: By contrast, in the current proposal a realistic scenario could involve some Dow products being taken off the market in Europe. But even Dow's language on the website fails to mention the implications for the company of the portion of Dow chemicals that they imply will fail a risk management screen.

In the REACH Program in its current formulation a targeted and nonexempt substance would be required to receive authorization to continue to be marketed in Europe. To be authorized, a targeted chemical must be controlled in its release and exposure to levels corresponding to prevention of potential harm to human health. Alternatively, a substance that is not so-controlled can still be authorized if it can be shown both that the socio-economic benefits outweighed the risk to human health or the environment rising from the use of the substance **and** there are no suitable alternative substances or technologies.

As discussed above regarding the GLWQA and the POPs treaty, policymakers have been concluding that it is necessary to ***eliminate*** products that lead to persistent, bioaccumulative toxicants, because they persist and magnify when they enter the environment and work their way up the food chain, therefore making the regular release of even small amounts dangerous because of their tendency to build up in living things . So it is unclear that Dow will be able to meet the "acceptable levels" test for some of its products.

---

[6] CEO William Stavropoulos, Presentation to the Smith Barney Citigroup "14th Annual Chemical Conference" Dec. 3, 2003.

Therefore, it could be necessary for the company to meet the latter test, showing **both** that the **benefits outweigh the risks** to human health or the environment and that there are **no safer substitutes available**. In a growing number of instances, harmful products produced in high volume by Dow **do have safer substitutes.** So, many Dow products may not be able to pass this test and receive authorization. The end effect: a potential end to European markets for some Dow products—but how many are at risk, and to what extent, is something that the management knows, and investors and the public are left to guess.

Dow Chemical's reporting does not provide any real assessment of the impacts of the possible REACH program -- the number of Dow products targeted by requirements for reporting, testing and authorization and the cost of these requirements, the relative significance of those products within the Dow product family or the implications of the company's commitments to "risk management" of toxic product lines. Instead of providing a reasonable assessment of the range of potential impacts of the program, and the product lines at stake, the Dow website reporting provides a uselessly distorted view based on Dow's hopes to modify the proposed program. Without providing shareholders with a realistic assessment of the potential impacts of the REACH program, the shareholders are unable to assess issues relative to the large policy challenges looming on the horizon.

D. Environmental remediation and liability estimation

The Dow web page on environmental remediation describes how costs of environmental matters such as site remediation are accrued.[7] The policies for reporting these liabilities are described in general terms in both the company's annual reports to shareholders and on the web page. The company reports on the web page and in its shareholder reports that it "accrues the costs for environmental matters when it is likely the liability has been incurred and the amount of the liability can reasonably estimated based on current law and existing technologies."

Remarkably, it is not possible to ascertain from the website or the company's shareholder reports whether the enormous potential liabilities associated with Midland, Michigan have as yet been accrued and reported.

Dow's production facility in Midland has produced chlorinated compounds for more than 60 years. In 2001, extensive dioxin contamination was discovered downriver from Dow's manufacturing facility and water discharge outfalls. The dioxin contamination is thought to have resulted primarily from historical operations and some catastrophic releases, particularly related to flooding, although the company continues to release the compound. **The contamination extends more than 20 miles downstream from Dow's manufacturing site and appears to be distributed throughout floodplain soils.** According to state regulations, cleanup is required if dioxin levels are higher than 90 parts per trillion (ppt) in a residential area. Samples tested thus far range from background to more than 7,200 ppt, more than 80 times the state cleanup standard.[8]

---

[7] www.dow.com/environment/debate/d11.html

[8] See Michigan Department of Environmental Quality web page: Tittabawassee River Flood Plain Contamination http://www.michigan.gov/deq/0,1607,7-135-3308_21234-43808--,00.html.

Dow Chemical management attempted late in 2002 to negotiate an agreement with the state of Michigan to elevate the standard of contamination allowed in some of the contaminated area. However, after a lawsuit by environmental organizations, the effort to elevate the standard was dropped. As a result there is a wide area downstream of the facility that must be subject to remediation. The company has never provided investors with an assessment of how that failure affects the magnitude of liabilities facing the company.

Since then, the company has been in an ongoing battle with the state of Michigan regarding the studies needed to assess the extent of remedial obligations. According to an Associated Press story of December 4, 2003, Al Taylor, senior geologist for the DEQ's hazardous waste division, said that Dow Chemical's proposed contamination study plan is not sufficient. The plan gives Dow too much time to complete its work. Taylor wants to see the timeline compressed to "this year or as soon as possible." It also lacks plans for sampling soil in Midland neighborhoods near Dow, for identifying properties in Saginaw Township where residents are at high risk for dioxin exposure, and for posting warning signs in public parks along the river, Taylor said.

Despite the company's delays, other studies are being done that are escalating the level of concern. For instance, a 2003 report from the Michigan Department of Environmental Quality states that the high levels of dioxins in the Tittabawassee River are also found in local fauna, including several species of fish, and fish eating birds and mammals. Bioaccumulation of the toxicant in local birds was in some instances 200 times higher than the level known to cause harm, such as reduced fertility and early life stage death. The Midland Daily News, 10/08/2003. Now a pilot study is being conducted by the Michigan DEQ to assess levels of dioxin found in the blood of Tittabawassee River flood plain locals. The investigation is a precursor to a larger study that could include hundreds of test samples. Midland Daily News, 1/7/2004.

The company's apparent failure to estimate and disclose Midland area liabilities may have striking parallels to the company's handling of liabilities associated with asbestos. At the time that Dow acquired the Union Carbide company it apparently did not even mention the issue of potential asbestos liabilities. The company was never able to directly estimate liabilities associated with Union Carbide's asbestos – instead, it calculated liabilities by considering the trends in liability for other similar cases at other companies. The result was a large estimate $2.2 billion in liabilities over the next seventeen years, and a write down of Dow assets by $828 million.

The issues surrounding the Midland site, if they are not already accrued as part of currently reported environmental remediation obligations, may represent another large hidden liability akin to asbestos. It is possible, and the proponents believe, necessary, for Dow Chemical to do as it did with asbestos -- to base interim liability projections on other similar cases in the field. Calculating the range of costs in this way is relatively straightforward – e.g. estimation of potential volume of soil that could be required to be removed and treated in the floodplain, number of households to be relocated, etc.

There are extensive databases of contamination cleanup and liability costs available to the management, which is best situated to suggest the range of potential costs associated with Midland. For example, Solutia Inc., a subsidiary of Monsanto Co., is expected to spend at least $700 million for liabilities with regards to PCB contamination in and around its 70 acre facility in West Anniston, AL. Total cost for Anniston includes about $50 million in cleanup costs and about $700 million in tort judgments and settlements. (WSJ 8/21/03.) Other sites with contaminated downriver soils can provide good references for the costs of cleaning up contaminated soil.

E. Agent Orange Liabilities

Between 1962 and 1971, approximately 20 million gallons of Agent Orange were used in Vietnam.[9] At least 100,000 US troops – and possibly many more – were exposed to the dioxin containing herbicide.[10] The Institute of Medicine (IOM) states in its 2003 report, Veterans and Agent Orange, that there is a positive association ("in which chance, bias, and confounding could be ruled out with reasonable confidence") between exposure to Agent Orange and soft-tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease, chloracne and chronic lymphocytic leukemia. Furthermore, the IOM reports that limited/suggestive evidence connects exposure to elevated levels of respiratory cancers, prostate cancer, multiple myeloma, porphyria cutanea tarda, acute and subacute transient peripheral neuropathy, and spina bifida in the offspring of the exposed.[11]

In the 2003 Supreme Court decision of Dow Chemical v. Stephenson, the court reopened the right of thousands of veterans and their families -- who claim to have developed illnesses after 1994 due to Agent Orange. They now have a right to file suits against the manufacturers of Agent Orange, including Dow Chemical. As a result of improved scientific studies in the years since the original Agent Orange settlement, causal connections to some illnesses alleged in the new litigation are backed with additional, strengthening scientific evidence. The original Agent Orange settlement was for $180 million.

To make matters worse, a study by the US Air Force released January 23, 2004 found that Air Force veterans exposed to Agent Orange during the Vietnam War have a higher-than-average risks of prostate and skin cancer. The ongoing study of 2,000 Vietnam veterans showed for the first time an elevated risk of melanoma, the deadliest form of skin cancer. Previous studies have found increased risks of prostate cancer, chronic lymphocytic leukemia and also diabetes.

The company's website reporting regarding the Agent Orange case[12] fails to substantively do what the resolution requests, namely to assess the range of potential liabilities. Instead, it mentions a series of defenses that its lawyers hope will work to the company's advantage in the courts. Dow has so far failed to provide quantification for its

[9] http://www1.va.gov/agentorange/
[10] www.cnn.com/2001/HEALTH/conditions/04/19/agent.orange/
[11] americasveterans.org/news/060003b.html
[12] www.dow.com/environment/debate/d10.html

investors of the range of potential costs associated with Agent Orange in the event that the company loses the legal arguments remaining such as the government contractor defense.

F. Deciding that Dow's reporting does not amount to substantial implementation is consistent with SEC staff precedents.

Often companies have argued that the limited reporting that they have done is substantial implementation, and SEC staff has concluded it was not. For example, in Raytheon (Feb. 26, 2001) the proposal requested that the board conduct a special executive compensation review to "look for ways to link a portion of executive compensation to measures of employee satisfaction," and summarize the results of this review in the Compensation Committee's report to shareholders. Raytheon argued that it regularly conducts an executive compensation review across a variety of factors. The proponent prevailed by arguing that, "from the information provided in the Committee's report to shareholders in last year's proxy statement and from Raytheon's letter to the SEC it is not clear that the inclusion of 'people-related incentives' is anything more than an aspirational platitude." This is very similar to the present case, where the company's statement that it considers phasing out products is not backed up with reporting on what will be phased out by when.

In ExxonMobil (March 24, 2003) the proposal asked the board to report on the effect of the health pandemic on Exxon's operations in Sub-Saharan Africa and its response to the pandemic. Exxon claimed it had reported extensively on the topic, including reports to shareholders as well as others. SEC staff disagreed that the reporting amount to substantial implementation.

In ExxonMobil (March 17, 2003) the proposal requested Exxon to prepare a report describing any operating, financial and reputational risks to it associated with climate change and explaining how Exxon will mitigate those risks. Exxon argued its extensive previous reporting to shareholders and the public on climate change issues and the Company's approach to these issues more than satisfies the Proponent's request. SEC staff disagreed.

In Johnson and Johnson (Feb. 25, 2003) the proposal requested J&J's Compensation Committee to consider advances in the areas of equal employment opportunity and work place diversity when determining compensation for senior executives, and report to shareholders on implementation of this policy. J&J argued that it already considers progress toward meeting goals for equal opportunity in employment, development and advancement in its executive compensation and has already made this information publicly available to shareholders through information in its 2002 proxy statement. The SEC staff disagreed.

A proposal to American Electric Power (Feb. 18, 2003) required the board to issue a report disclosing: (a) the economic risks associated with the company's past, present, and future emissions of carbon dioxide, sulfur dioxide, nitrogen oxide and mercury emissions, and the public stance of the company regarding efforts to reduce these emissions; and (b) the economic benefits of committing to a substantial reduction of those emissions related to its current business activities. AEP argued that by complying with its federally mandated

disclosure obligations by substantially duplicating its disclosure required by Items 303 and 101(c)(xii) of Regulation S-K and including it in its Annual Report on Form 10-K in Appendix A to the Proxy Statement, AEP already substantially implemented the Proposal. Furthermore, AEP had much of the information available on its website. The proponent prevailed, arguing that a review of the Company's public filings, including its annual report filed on Form 10-K and its proxy statements, shows that the Company has in fact not provided the information requested in the Proposal.

Similarly, in Kohl's (March 31, 2000) the proposal requested the board report on Kohl's vendor standards and compliance mechanisms in the countries where it sources. Kohl's argued that because it responds to inquiries from customers, shareholders and others explaining the Policy and the Company's inspections and evaluation procedures of its Vendor Partners, it substantially implements the Proposal's request for a report to shareholders. The proponent prevailed by asserting that assurances of "paper guidelines" are insufficient when "the Proposal is addressed to the question of whether those guidelines are being implemented and enforced as opposed to being mere pieces of paper." Also, claiming that the information is available to shareholders without informing them of this possibility "is no report at all."

II. The resolution is not excludible as ordinary business because its focus is on fundamental public policy issues facing the company.

A. Dow's dioxin-producing products pose an ever-increasing public policy challenge to the company.

Dioxins are a general scientific term used for a group of chlorinated substances -- dioxins and furans -- which all exhibit similar chemical and physical properties. Seventeen members of this group are considered most toxic. USEPA, Draft Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-*p*-Dioxin (TCDD) and Related Compounds, September 2001.

Dow produces an array of products which can lead to the emission of dioxins. According to industry data, dioxins are produced and emitted in the production of vinyl chloride monomers (VCM's), for instance. Dow is one of the world's largest producers of these feedstocks -- materials that are the components of polyvinyl chloride plastics. When polyvinyl chloride products are disposed after use, their incineration is also believed by many experts to lead to the generation of dioxin, for instance, in municipal incineration or in house, car, or landfill fires. While the amount of dioxins released depends most importantly on combustion conditions and control technologies, dioxin is indisputably released. USEPA, Draft Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-*p*-Dioxin (TCDD) and Related Compounds, September 2001.

Dow also produces a variety of chemicals that can be associated with dioxin formation either during manufacture, or during disposal if incinerated. Those chemicals include chlorinated pesticides, chlorinated solvents, and elemental chlorine. The environmental advocacy group Greenpeace has targeted Dow as one of the leading root sources of dioxin given the

company's product line and an assessment of dioxin formation associated with the entire life cycle of the company's products. Greenpeace, *Dow Brand Dioxin*, 1995.

The Environmental Protection Agency issued its Updated Draft Reassessment of Dioxin in 2001. The in-depth scientific review, the most exhaustive review of a single compound ever undertaken by the agency, affirmed and amplified the already known hazards of dioxins. The biggest change in the new draft is that EPA has found that the cancer risk from exposure to dioxin is 10 times greater than reported in 1994. The new review also underscores concerns about the developmental and reproductive effects of dioxin exposure in children indicating that children, particularly developing infants, are highly sensitive and vulnerable to the toxic effects of dioxin. The review concludes that impacts on development, the reproductive system and metabolism—may be occurring in people who are exposed to the high end of the general population's "background" levels.

There is also human evidence that dioxin is toxic in tiny amounts, and can disrupt many systems of the body. The large body of evidence on dioxin has demonstrated effects including cancer, reproductive and developmental harm, disruption of normal hormone functions, skin rashes (chloracne), immune suppression, endometriosis, diabetes and liver damage.

During 2003, the Dow Chemical Environment, Health and Safety team heard a presentation from the USEPA regarding the dioxin reassessment. Linda Birnbaum, Director of the EPA's Environmental Toxicology Division, Health Effects Research Laboratory, informed Dow officials that the information used by EPA in assessing cancer risks is based on human evidence, and shows that <u>any</u> exposure to dioxin poses an added cancer risk.

New attention has been focused in the last year on the human "body burden" of dioxin – that is, the amount of the chemical found in the tissues of humans. Previous testing has shown that many Americans already have levels of this compound in their bodies, with any additional exposures only adding to that risk.

Persistent bioaccumulative toxics (PBT's) are substances that are known to persist in the environment, accumulate and bioconcentrate in the food chain, and cause threats to life as a result of their presence. Because of these characteristics, even small amounts of PBT's, if released over time, have the potential to concentrate in the food chain, posing risks to consumers.

Numerous public policy bodies and instruments are targeting products that lead to PBT's and dioxins as a priority public health and environmental concern.

In 1993, the American Public Health Association, the largest association of public health professionals in the US, with over 50,000 members, endorsed a phase-out of chlorine and chlorinated compounds in industry processes, in part, because of the link between PBT formation and chlorinated products. The proposed phase-out would only allow exceptions if an industry could show that an individual use is safe.

In 1992 and again in 1994, the International Joint Commission on the Great Lakes recommended that the United States and Canada develop a timetable to sunset the use of chlorine and chlorine-containing compounds in industrial feedstocks because of potential PBT formation during manufacture, use and disposal. Their recommendation was based on their reading of the Great Lakes Water Quality Agreement, an agreement negotiated between the US and Canada.

In Europe, the Paris Commission on the Northeast Atlantic and the Barcelona Convention on the Mediterranean Sea and several other informational forums have called for the total elimination of chlorine in manufacturing processes.

The Stockholm Convention on Persistent Organic Pollutants, signed May 2001, states in its Annex C , which addresses dioxins, that:

> Priority should be given to the consideration of approaches to prevent the formation and release of the chemicals .... Useful measures could include:
> (a) The use of low-waste technology;
> (b) The use of less hazardous substances;
> (c) The promotion of the recovery and recycling of waste and of substances generated and used in a process;
> (d) Replacement of feed materials which are persistent organic pollutants or where there is a direct link between the materials and releases of persistent organic pollutants from the source;
> (e) Good housekeeping and preventive maintenance programmes;
> (f) Improvements in waste management with the aim of the cessation of open and other uncontrolled burning of wastes, including the burning of landfill sites. When considering proposals to construct new waste disposal facilities, consideration should be given to alternatives such as activities to minimize the generation of municipal and medical waste, including resource recovery, reuse, recycling, waste separation and promoting products that generate less waste. Under this approach, public health concerns should be carefully considered;
> (g) Minimization of these chemicals as contaminants in products;
> (h) Avoiding elemental chlorine or chemicals generating elemental chlorine for bleaching.

It also states that:

> When considering proposals to construct new facilities or significantly modify existing facilities using processes that release chemicals listed in this Annex, priority consideration should be given to alternative processes, techniques or practices that have similar usefulness but which avoid the formation and release of such chemicals.

In 2003 the European Union, through the European Commission, proposed a new Europe-wide chemical regulation program, known as REACH. REACH stands for Registration,

Evaluation, and Authorization of Chemicals. Registration requires companies to provide data on their products including toxicity and information about how humans or the environment might be exposed to them. This places the responsibility and cost for information about the industry's products on the industry. Evaluation is required for chemicals produced in large amounts or chemicals that are especially toxic. One consequence of evaluation might be to ban certain uses of a chemical. The most toxic chemicals would require authorization. These chemicals could include carcinogens, mutagens, reproductive toxicants, and chemicals that persist and accumulate in the environment. One potential outcome of the authorization requirement can be an outright ban on a chemical in favor of a safer alternative.

As indicated by these examples, the focus of policy instruments at every level is increasingly on giving priority to the *elimination of production* of persistent bioaccumulative substances, because policymakers have concluded that as long as these products are marketed, they will eventually enter and pollute the environment through products and disposal pathways. Therefore, several of the products that the Company is producing are not only targeted by public policy for emissions reduction at the site of production but they are also targeted for phase-outs of product sales and distribution.

B. Because the resolution relates in its entirety to major public policy issues facing Dow Chemical, it cannot be excluded under the ordinary business exception.

A proposal cannot be excluded by Rule 14a-8(i)(7) if it focuses on significant policy issues. As explained in *Roosevelt v. E.I. DuPont de Nemours & Company*, 958 F. 2d 416, (DC Cir. 1992) a proposal may not be excluded under clause (c)(7) if it has "significant policy, economic or other implications". *Id. at 426.* Interpreting that standard, the court spoke of actions which are "extraordinary, i.e., one involving 'fundamental business strategy' or 'long term goals.'" *Id. at 427.* Although the company implicitly acknowledges that the proposal raises public policy issues, it contends that the details suggested in the supporting statement delve into excludable ordinary business matters rather than major policy issues. As we will explain below, in this instance the items requested in the proposed report are at a level of summarization needed to illuminate trends related to the public policy issues facing the company. Therefore the proposal may not be excluded, because it deals exclusively with major policy matters.

> i. Requests for the company to report on whether and when the company will phase out products and processes leading to emissions of persistent organic pollutants and dioxins are major policy questions rather than ordinary business.

The resolved clause of the shareholder resolution primarily asks the company to issue a report summarizing its response to public policies calling for the company to phase out products and processes leading to emissions of persistent organic pollutants and dioxins. In light of the above discussion, the questions of phase-out of products and processes, is clearly a major public policy issue and reflective of major, long term strategic questions facing the company.

Thus the phase-out proposal is consistent with numerous similar public policy resolutions on chemical phase-outs which have been determined by Staff to not be ordinary business. This included last year's Dow Chemical resolution by the proponent. (March 7, 2003). In that resolution, as in this year's, the primary focus was on the need for reporting on the company's responses to public policies calling for the phase-out of certain product lines that result in the generation of persistent toxic substances.

A long line of SEC staff precedents regarding product and materials phase-outs supported the staff's decision that the Dow resolution in 2003 was not excludable as ordinary business.

For example, in the HCA/Columbia and Universal Health Services decisions (both available March 30, 1999), health care providers were asked to phase out the use of polyvinyl chloride in medical devices. Also, a similar resolution was found not to intrude on ordinary business, focusing on medical device manufacturer Baxter International (available March 1, 1999) calling for the company's phase-out of PVC in medical devices. PVC is one of the key substances produced by Dow that would also be a target of the present resolution.

In Time Warner Inc. (available February 19, 1997) a resolution on the phase out of the use of chlorinated paper by the publisher, as a paper user, was found to not be ordinary business. In Union Camp Corporation (available February 12, 1996) a resolution asked the company to "establish a schedule for the total phaseout of processes involving the use of organochlorines in its pulp and paper manufacturing" (due to dioxin concerns). The Staff ruled that it could not be excluded as relating to ordinary business. In Chevron Corporation (available Feb 11, 1998) a requirement to report on toxic compounds, including dioxin, released from refineries, was found not to be ordinary business.

Also relevant are tobacco cases such as those involving Philip Morris and Loews Corporation (parent of tobacco company Lorillard). In Philip Morris Companies, Inc. (March 14, 1990) the proposal requested the company to amend its Articles of Incorporation to provide a prohibition against the company engaging in the tobacco business after a specified date. It was found not excludable as ordinary business. In Loews (available Feb. 22, 1990) a shareholder proposal for eventual cessation of manufacture of tobacco products, the company unsuccessfully argued that directing it to phase out its focus on particular products involves "ordinary business operations".

The proposal is also consistent with a previously allowed Dow Chemical resolution (available February 11, 1980) which requested the company to:

> "establish a review committee to examine and evaluate the existing and potential health consequences of 2.4,5-T, Silvex and their derivatives, and to make recommendations to the Board relating to the economic justification of continued production of these herbicides. The committee shall have the following structure and duties;
>
> 1) The committee shall be no less then seven persons and shall include outside directors and representatives of management, employees and non-company persons expert in environmental science, medicine and public health;

2) Release its report-on the public health consequences of these herbicides to the board and shareholders within 6 months of the 1980 annual meeting;

3) Funds to be expended by the committee shall be limited to reasonable amounts as determined by the board.

Be it further resolved that the shareholders request that Dow Chemical place a moratorium on all production destined for export of these herbicides until publication of the review committee report."

In that matter, Staff responded that the resolution was not directed to Dow's ordinary business operations despite its consideration of the consequences and economic justification of individual products. The staff concluded that this was not directed to the ordinary business operations of the Company.

More than twenty years after that Staff decision, the company is deeply enmeshed in and affected by the public policy issues related to its production, sales and release of products which can lead to the generation of persistent toxic substances including dioxins. Dioxin contamination as a result of historic and ongoing operations by the company remains an important issue. Dow's operations, at their global headquarters in Michigan, are thought to be responsible for contamination of an entire watershed downriver from its plant. The company is facing substantial liability in that matter. The 1980 resolution is environmentally relevant today, because dioxin generated as part of 2,4,5-T production may have added to the dioxin loading in the region now looming as a substantial liability. Dow's operations at other plant sites may well also have resulted in some contamination of the local environment.

As public policy increasingly moves towards greater concern and control of dioxin and other PBT's, the issue only grows in importance and relevance for the company and its shareholders.

The proponent believes that if the company does not heed public policies calling for the speedy phase out of dioxins and persistent toxic compounds, and products which significantly generate these compounds during their life cycle, it will also be vulnerable to additional damage suits which could negatively impact shareholder value. It may also be vulnerable to loss of market share due to downward pressure on product sales and production worldwide.

The company notes that it has set a goal of reducing its dioxin emissions to air and water by 90% by the year 2005 and reports expenditures in excess of $250 million toward this goal. But this statement does not answer the fundamental question of whether and when the company will act consistently with the international treaties and other public policy measures that call for the *elimination* of dioxin emissions and precursors, and give preference to strategies for eliminating dioxin and PBT's at the source, that is, shifting away from harmful products rather than only controlling emissions once generated at Dow facilities. The company's 2005 dioxin reduction goal, while a positive development, is largely unresponsive to the policy challenges ahead. Reducing its previous high volume of emissions to a smaller level still will leave dioxin emissions to be controlled. **More importantly, the 2005 goal does**

not address the very large problem of Dow products which enter the marketplace and cause dioxin or persistent toxic chemical emissions in their use or disposal – emissions which include large uncontrolled sources - the problem which has led to the characterization of the company as the largest manufacturer of dioxin precursor products.

The issues involved are not ordinary business because they address "a major ecological and environmental matter." In Maxxam Inc. (available March 26, 1998) the Staff concluded that a proposal requesting the company to prepare a report on strategies for ending all operations that cut, damage, remove, mill or otherwise involve old growth trees was not ordinary business. The staff noted that it was not ordinary business because it related to the adoption of a policy "designed to address a major ecological and environmental matter."

The company also cites in footnote 4 the Duke Energy Corp. resolution(Feb. 1, 1998), where the proponents had attempted to impose very specific emission control standards of 5 lbs. of NOx per million btu's of heat by 2007. This was akin to imposing a specific regulatory standard on the company, in other words micromanaging. In contrast, in the present case the proponents are asking a much larger question about whether and how the company will meet treaty goals and other policy measures which shift away from certain products and processes, and additionally, a summary of the costs in recent years from the company's failure and resistance to making such a shift.

ii. Requested reporting on policy developments does not amount to an attempt to control lobbying so as to be excludible "ordinary business."

The request to report on various policy developments in no way represents an excludible attempt by the proponent to dictate the company's lobbying practices. Although the resolution asks for reporting regarding some issues of public policy that are in current deliberation, the resolution does not ask for the company to take any particular position in the context of lobbying. Moreover, even if it did, there is precedent for allowing such concerns and requests as part of resolutions addressing larger public policy issues.

SEC staff did not treat as ordinary business a resolution asking Bank of America (avail. December 30, 1999) to adopt a policy that it not make or solicit any political contributions. And it did not treat as ordinary business a resolution directed toward General Electric (Avail. December 20, 1999) requiring a summary of GE's federal and state campaign finance contributions, policies on allocation of shareholder funds for political purposes, or lobbying position on campaign finance reform.

Proponent believes that the company is keeping shareholders in the dark on information that, taken together, may demonstrate the material impacts of the company's materials policies.

With regard to resolutions on lobbying and political matters, if anything the commission staff has grown more lenient in recent years. For instance, it did not treat as ordinary business a resolution asking Bank of America (avail. December 30, 1999) to adopt a policy that it not

make or solicit any political contributions. And it did not treat as ordinary business a resolution directed toward General Electric (Avail. December 20, 1999) requiring a summary of GE's federal and state campaign finance contributions, policies on allocation of shareholder funds for political purposes, or lobbying position on campaign finance reform.

In the Coca-Cola Company (February 2, 2000), the resolution called for the board to require Coca-Cola to promote the retention and development of bottle deposit systems and laws and to cease efforts to replace deposit and return systems in developing countries. The company argued that the Proposal would be excludible as ordinary business because it would necessitate lobbying for, and not against, laws requiring bottle deposit systems. The proponent prevailed after arguing that the proposal concerns broad social issues; more specifically, the need to alter economic actions in order to meet the needs of (ecological and social) sustainable development.

In General Electric Company (February 9, 1998), the resolution called for the Company to develop and report on criteria for military contracting, the company argued that two-thirds of the proposed criteria listed in the supporting statement are clearly generic business issues (e.g., ethical business practices; environmental impact; stability of employment; lobbying and marketing; competitive bidding; prison, child, or forced labor). The Proponent prevailed, however, by arguing that the subparagraph of the proposal dealing with lobbying and marketing is intended to raise the military related issue of whether the company generates demand for armaments, either in foreign countries or here in the United States. Because the proposal specifically concerns "military criteria," it is not excludable by virtue of (c)(7).

In Chevron Corporation (March 23, 1987), the resolution called for the corporation to 1) state publicly to the Angolan Communist government that it will terminate operations in Angola unless the government takes [a series of step listed] and 2) expend no resources to influence the policy of the U.S. government concerning Angola, Namibia, Zaire, and South Africa. The Company argued that the Proposal would interfere with Chevron's ability to exercise its business judgment in the selection, operation, and closing of corporate facilities and in the conduct of lobbying activities in an area directly related to the Corporation's ordinary business. The SEC staff rejected this argument because even though lobbying of the Angolan government might have been affected, the resolution related to a major public policy issue.

The present resolution does not attempt to dictate the company's political activities or lobbying. The resolution is not prescriptive in defining any lobbying perspectives or actions to be taken in the course of, or after, preparing the requested report.

iii. Requested reporting of liability estimates does not render the resolution excludible as ordinary business.

In 2003, the proponent's resolution (in the supporting statement) asked that the company "include a description of any major controversies involving community and environmental stakeholders concerning the remediation of particular sites including Michigan, and reasonable projections of any material liabilities for cleanup or otherwise related to the contamination."

This year, in light of the emergence of the Agent Orange decision of the Supreme Court in Dow Chemical v. Stephenson, which may have opened the gates to additional dioxin-related Dow liabilities, the resolution asks for a listing of the reasonable range of projected costs of remediation or liability anticipated for (a) Midland, Michigan, (b) Agent Orange, and (c) each of the other potentially material toxic sites and issues facing the company.

The resolution asks for a reasonable range of liabilities because, in trying to understand the company's opaque shareholder reports, it became apparent that the company may be providing no estimates for these liabilities in its ongoing shareholder reporting, or may be only reporting the lowest of a range of possible estimates.

The present case is very different from the recent SEC decisions in which the staff regarded requests for reporting on corporate risks as ordinary business. This case stands in stark contrast to cases such as Willamette Industries (March 20, 2001) (proposal to create an independent committee to prepare a report of Willamette's environmental problems and efforts to resolve them, including an estimate of worst case financial exposure due to environmental issues for the next ten years, excluded per Rule 14a-8(i)(7)); and Xcel Energy Inc. (April 1, 2003) and Cinergy Corp. (Feb. 5, 2003) ((both seeking reporting on the economic risks associated with the Company's past, present and future emissions of carbon dioxide, sulfur dioxide, nitrogen oxide and mercury emissions and the economic benefits of committing to a substantial reduction of those emissions). In those cases, shareholder proposals were in essence using the vehicle of a shareholder resolution to principally attempt to set general requirements for reporting of whole large categories of risk at those companies. For example, in the Xcel and Cinergy cases a nearly identical resolution was proposed which would have required reporting on global warming impacts on the company. The resolution was notable in its breadth and vagueness -- attempting to prescribe a standard for ongoing risk reporting for the long term -- something that a company already does or should be doing in its annual 10 K reports and as part of the management discussion and analysis. Similarly, in the Willamette case, shareholder proponents attempted to prescribe a framework for reporting of environmental liabilities, namely an estimate of worst case financial exposure due to environmental issues for the next ten years.

In those other instances, shareholders have attempted, through a resolution, to make a policy issue out of a company's environmental accounting practices. In other words, the entire resolutions basically revolved around whether or not the company was engaged in appropriate environmental accounting.

By contrast, the present resolution is not about the environmental accounting practices of Dow Chemical. Instead, it is about the challenges posed to the company in its production and use of particular toxic chemicals targeted by policymakers. The quantification of related liabilities is a necessary piece of information for any shareholders who want to consider whether the management is moving in an economically wise direction in continuing to emphasize production of some of the most toxic chemicals on the market. Shareholders are asking here

through the resolution for the company to quantify potential big-ticket items related to the substantial public policy controversy.

The key factor in SEC staff decisionmaking is whether the resolution addresses a large public policy challenge that is facing the company, and whether the elements of the resolution collectively address issues within the zone of issues that shareholders are reasonably concerned with.

In the present instance, the resolution, in the context of a broad array of policy concerns, simply asks for the company to fill gaps in reporting on specific, known public controversies facing the company. The company has been requested to provide projections of the range of possible liabilities associated with Midland, Michigan and Agent Orange and each of the other potentially material toxic sites and issues facing the company.

At present the company is apparently providing no such projections. See the discussion in the "substantial implementation" section of this letter.

The recent history of major liabilities that were underreported to Dow shareholders alone elevates the resolution above ordinary business. These concerns were not foremost in the resolutions excluded by SEC staff as ordinary business. Dow Chemical has developed a sordid record of providing poor or misleading disclosure of toxic risks and liabilities. For instance:

• The company advertised to consumers that its product Dursban was safe despite a 1994 agreement with the New York Attorney General's office that it would not do so. The Dow pesticide Dursban (chlorpyrifos) is believed to be associated with illness in thousands of exposed people, including potential neurological damage to children. The EPA fined the company $732,000 in 1995 for failing to disclose reports of adverse effects associated with use and exposure to Dursban. In 2003, the company settled a threatened consumer fraud lawsuit by the New York State Attorney General for $2 million, a record level for a consumer pesticides suit in New York, due the company's continued marketing of the products as safe for various uses. In 1994, Dow had agreed to review and change its advertising claims. Underlying the Attorney General's threatened suit were several label claims, advertisements and web publications. For instance, as late as 2003, the Dow Chemical website claimed: "Consumer exposure from labeled use of chlorpyrifos products provides wide margins of safety for both adults and children." By contrast, according to Dr. Philip Landrigan, chair of the Department of Community and Preventative Medicine at Mount Sinai Medial Center, "Excellent studies conducted by independent scientists have clearly shown that chlorpyrifos, the active ingredient in Dursban, is toxic to the human brain and nervous system and is especially dangerous to the developing brain of infants." **(Note: the Attorney General's threatened suit and the $2 million settlement were apparently not disclosed in Dow's SEC filings.)**

• The company acquired Union Carbide without disclosure of the enormous associated asbestos liabilities to shareholders. The disclosure and estimation practices at Dow Chemical are presumably so inadequate that the company didn't even realistically estimate and disclose the enormous long-term asbestos liabilities associated with the acquisition of Union Carbide until two years after the purchase of Carbide stock. It apparently failed to even disclose any mention of the asbestos issue when it acquired Union Carbide, only to announce, two years later, that with Union Carbide came a $2.2 billion projected liability for asbestos – and an $828 million write-down of assets as a result. Now, the proponents believe, there is a similar risk that additional, large liabilities have not been characterized to shareholders.

• Dow has stated that "there is absolutely no liability" associated with Bhopal due to the purchase of Union Carbide, yet there are currently $74 million dollars in Union Carbide assets attached in India pending the company's appearance in the criminal case pending against the company.

Today there are potentially major undisclosed liabilities looming for Dow Chemical. The ground-breaking Supreme Court decision in 2003 in Dow Chemical v. Stephenson opened the gates for thousands of veterans to pursue new litigation for personal injuries against Dow and other producers of Agent Orange – yet the company has engaged in no public assessment of these liabilities nor even a discussion of this case in its shareholder filings.

The remedial costs and liabilities associated with the extensive contamination of properties downstream from Dow Chemical headquarters have also not been articulated either narratively or quantitatively by the company. The dioxin contamination of Midland, Michigan, where the company's headquarters is located, is a major topic of public controversy and is likely to impose expensive costs on the company and its shareholders. The request for better disclosure of remedial costs is appropriate because of the large costs that may result at those sites. It also may help to give a sense of what lies ahead if the company does not move toward phase out of production of the relevant products.

The precedent for requiring reporting on site remediation plans is clear. Although SEC rules already require some reporting on remediation, various resolutions cleared by SEC Staff have requested additional reporting. For example, a resolution filed with Kodak requested that it disclose progress on a list of hazardous waste sites and other circumstances in which the company expects to accrue environmentally based financial liabilities. (avail. Feb. 1, 1999). This resolution was cleared by Commission staff on other charges. It was not even asserted to constitute "ordinary business," despite the detailed request:

> The shareholders request Kodak's Board to disclose in its environmental progress report, a complete listing of all hazardous waste sites where Kodak is a potentially responsible party, and other circumstances in which the company and its shareholders can be expected to accrue environmentally-based financial liabilities through retirement of operations, court orders, consent decrees, litigation, or government

requirements, that environmental remediation, pollution clean-up, pollution equipment upgrades, and/or damage compensation.

A similar resolution was filed in Advanced Micro Devices (available February 25, 1998) in which a set of policies related to environmental contamination were requested to be disclosed. The Staff concluded that the resolution was not excludable as ordinary business.

Shareholders who may be fortunate enough to be familiar with the existence of Dow Chemical's litigation are left guessing regarding the management's appraisals of the range of possible impacts that these matters may have on the company's finances. These liabilities exemplify a deep problem and challenge facing the Dow Chemical Co. As long as this company continues to make a specialization of toxic product lines, enormous problems like Midland and Agent Orange are an inevitable result. Shareholders who come to understand this through the disclosures requested in the shareholder resolution will be empowered to press the management for the needed changes.

The company has been named as a potentially responsible party under federal or state Superfund laws at 24 different sites. Given the poor liability disclosures regarding asbestos, Midland, Agent Orange, etc., it is reasonable to wonder whether there are other potential big ticket liabilities among those sites.

In the present matter the issue of disclosure of liabilities is enmeshed in a number of other elements of the broader public policy issue of toxic chemical phase-outs. It is a logical element of the disclosures sought by the investors seeking to address a clear public policy challenge facing the company.

In the aftermath of Enron and Tyco one of the most important lessons learned is the apparent failure of the web of legal and regulatory mechanisms to prevent companies from concealing liabilities. The issue of corporate concealment of environmental liabilities has been well documented numerous reports and advocacy efforts.[13] The self-help remedy of a shareholder resolution to flag particular liabilities, known to an investor to be one facet of a larger policy challenge facing the company, is an entirely appropriate element of securities law and policy. The vehicle of a shareholder resolution is a congressionally guaranteed right of a shareholder to organize and galvanize investors on issues of obvious concern to them. Nothing could be of greater concern to the shareholders of Dow Chemical than the apparent failure of the management, once again, to quantify some major liabilities that may be coming their way.

In conclusion, we request the Staff to inform the Company that the SEC proxy rules require denial of the Company's no-action request. In the event that the Staff concludes that certain parts of the document may require revision, please be advised of the willingness of the proponent to make needed modifications. Also, we respectfully request an opportunity to confer with SEC staff in the event that the staff should decide to concur with the company.

[13] For advocacy efforts on the environmental accounting issue, see for instance the websites corproratesunshine.org and rosefdn.org.

Please call me at 781 894-0709 with respect to any questions in connection with this matter, or if the staff wishes any further information.

Sincerely,

Sanford Lewis
Attorney at Law

cc:
Ronald O. Mueller, Esq. Gibson, Dunn & Crutcher
Shelley Alpern, Trillium Asset Management
Tina S. Van Dam, Corporate Secretary, The Dow Chemical Company

RESPONSE OF PROPONENTS REGARDING NO ACTION REQUEST OF DOW CHEMICAL ON 2004 SHAREHOLDER PROPOSAL ON PERSISTENT TOXIC COMPOUNDS

APPENDICES

1. 2004 Shareholder Resolution

2. Excerpts from Tufts University report on Economics of PVC Phaseout

SHAREHOLDER RESOLUTION FOR 2004
DOW CHEMICAL ANNUAL MEETING
Report Regarding Certain Toxic Substances

Whereas:

Concerns about chemical hazards are growing. Increased monitoring is demonstrating widespread exposure from current and past practices. In the opinion of the proponents, related policy proposals and litigation will also grow, with implications for Dow.

New technologies of analysis make it possible to detect chemicals such as dioxin and pesticides in the bodies of people, even at low levels, and to identify trends in chemical exposures. Among these are compounds found in Dow products, such as Dursban. The testing may aid the correlation of exposure to disease, and liability suits against chemical producers.

Dow's Midland, Michigan manufacturing facility releases dioxin to air, land and water. The surrounding city and watershed are contaminated with dioxin, with levels detected in the floodplain downriver as high as 80 times the state's residential cleanup standard. A state advisory has warned that exposure to the contaminated soil could pose a health hazard. A class action lawsuit on behalf of as many as 2000 residents asserts property damages and seeks medical monitoring.

Agent Orange, a Viet Nam era pesticide, was contaminated with dioxins. US and Vietnamese veterans and their families are demanding compensation from Dow. A 2003 US Supreme Court decision may allow thousands of new US veterans' suits to proceed.

Emerging public policies may require changes in production and use of certain Dow product lines. For example, the European Union proposes requiring manufacturers that sell chemicals in Europe to provide data on hazards and uses, and would require special approval of certain "very high concern" chemicals, including some persistent and bioaccumulative toxics, carcinogens, mutagens and reproductive toxins. The Stockholm Treaty on Persistent Organic Pollutants and the Great Lakes Water Quality Agreement both encourage elimination of persistent toxic chemical products and precursors.

In the opinion of the proponents, management's sustainability report and SEC filings obscure rather than clarify some of the most important policy issues confronting Dow, because they leave gaps in disclosure, specifically:

- How public policies may impact the company's product lines, including the Stockholm POPs treaty, Great Lakes Water Quality Agreement and the

proposed European REACH program.

- The list of Dow Chemical products anticipated to require specific authorization or be restricted under the proposed European "REACH" program.

- A company plan and timeline for phase-out of each product involving a persistent, bioaccumulative chemical or byproduct, or an explanation of why alternatives cannot be substituted, explaining how the company will respond to rising regulatory, competitive and public pressure.

- A listing of the reasonable range of projected costs of remediation or liability anticipated for (a) Midland, Michigan, (b) Agent Orange, and (c) each of the other potentially material toxic sites and issues facing the company.

RESOLVED: Shareholders request that the Board publish by October 2004, at reasonable cost and excluding confidential information, a report filling the gaps in Dow Chemical transparency discussed above.

The Economics of Phasing Out PVC

Frank Ackerman
Rachel Massey

December 2003

Global Development and Environment Institute
Tufts University
44 Teele Avenue
Somerville, MA 02144
www.ase.tufts.edu/gdae

Table of Contents

EXECUTIVE SUMMARY 1

INTRODUCTION 4

- WHY WORRY ABOUT PVC? 4
- VINYL TODAY: A LOOK AT THE MARKET 5
- COSTS OF REPLACING PVC: THREE STUDIES 6

FACTORS FAVORING PHASEOUT 9

- LIFE-CYCLE COSTS OFTEN FAVOR ALTERNATIVES 9
- MASS PRODUCTION REDUCES COSTS 10
- PVC PRODUCTS CAN BE DANGEROUS TO USERS 11
- ENVIRONMENTAL PROTECTION COSTS LESS THAN ANTICIPATED 12

MARKETS FOR ALTERNATIVES 13

- ALTERNATIVES TO PVC, I: PIPES 13
- ALTERNATIVES TO PVC, II: ROOFING 18
- ALTERNATIVES TO PVC, III: FLOORING 22
- ALTERNATIVES TO PVC, IV: MEDICAL SUPPLIES AND GLOVES 28
- ALTERNATIVES TO PVC, V: SIDING AND WINDOWS 33

EMPLOYMENT IMPACTS OF A PVC PHASEOUT 36

- SIZE OF THE INDUSTRY 36
- EFFECTS ON PVC WORKERS 38

STEPS TOWARD ALTERNATIVES 40

- POLICY INITIATIVES TO PHASE OUT PVC 40
- INNOVATIVE CONSTRUCTION PROJECTS 43

CONCLUSION 45

ENDNOTES 46

Executive Summary

Polyvinyl chloride, also known as PVC or "vinyl," has become one of the most widely used plastics today. We encounter PVC on a daily basis in products ranging from toys, packaging, and lawn furniture to water and sewer pipes, medical equipment, and building materials.

PVC poses hazards to human health over the course of its life cycle. PVC production exposes workers and communities to vinyl chloride and other toxic substances. PVC products such as medical equipment and children's toys can leach toxic additives during their useful life. Vinyl building materials release hydrochloric acid fumes if they catch fire, and burning PVC creates byproducts including dioxin, a potent carcinogen.

The health hazards associated with the production, use, and disposal of PVC are, for the most part, avoidable. Alternatives are available across the range of PVC products. In some cases the alternatives are no more expensive than PVC; in other cases there is a small additional cost. Often there are good reasons to expect the costs of alternatives to decline over time.

Vinyl today: a look at the market

PVC sales reached 14.4 billion pounds in the US and Canada in 2002, or 46 pounds per person. Worldwide production was around 59 billion pounds, or an average of 9 pounds per person. With 5 percent of the world's population, the US and Canada consume 24 percent of the world's PVC. The principal uses of PVC in North America, in order of importance, are pipes, construction materials, consumer goods, packaging, and electrical products (such as wire and cable insulation).

Three in-depth studies have estimated the costs of phasing out PVC. The latest one, a 1997 study by Environment Canada, based on a detailed analysis of the cost of alternatives, suggests an average annual cost of $0.55 per pound. If this estimate still applied today, it would imply a total cost of $8 billion per year, or $25 per person, to phase out PVC in the US and Canada. Correction for one obviously dated assumption in that study cuts the estimate in half, to $4 billion total or $12 per person. However, there are several reasons to expect that the costs of alternatives will be still lower and will decline over time.

Factors favoring phaseout

Figures such as those from Environment Canada, based on current market prices alone, overstate the economic benefits of PVC. We explore four major economic reasons why this is the case.

- *Life-cycle costs often favor alternatives.* Some of the alternatives have higher initial purchase prices than PVC products, but are actually less expensive over the useful life of the product. Commercial flooring provides an example: among the flooring options we examined, vinyl has the lowest installed cost; but due to its shorter lifetime and higher maintenance requirements, it has the highest life-cycle cost. In such cases, rather than making a decision based on initial costs alone, purchasers can save money by comparing the full costs over the product life cycle of buying, installing, using, maintaining, and ultimately disposing of alternative products.

- *Mass production reduces costs.* Most products are cheaper when they are produced in large quantities; costs typically drop as production volumes increase. Currently the advantages of mass production favor PVC: many PVC products have achieved huge volumes, making them look cheap today. However, the alternatives to PVC could likewise grow in volume in the future, making them less expensive and more competitive than they are at present.

- *PVC products endanger their users.* The harmful effects of PVC are sometimes felt by the users of the product, as in the case of some PVC medical supplies. In case of fire, vinyl building products begin to smolder long before they burn, releasing toxic fumes of hydrochloric acid, and thereby threatening building occupants and firefighters. For this reason, the International Association of Firefighters supports efforts to reduce PVC use.

Related hazards could occur with PVC-insulated wiring, which was once standard for use in airplanes. There is no proof that PVC insulation has ever caused a plane crash, but some investigators have suggested that there are grounds for concern about older planes that are still flying with PVC-insulated wires.

• *Environmental protection costs are routinely less than anticipated.* Academic research has shown that the actual costs of compliance with environmental standards are often lower than the predicted costs. The strict standard for workplace exposure to vinyl chloride, the raw material for PVC production, established in 1974 by the Occupational Safety and Health Administration, led to profitable innovation, not vast economic losses (as predicted by industry when the standard was proposed). A recent study of the costs of controlling chlorinated pollutants confirms the pattern of advance overestimation of environmental management costs.

Markets for alternatives

Because PVC is used in such a diverse range of products, the nature of the alternatives and the likely costs of a phaseout differ from one market to the next. However, there are affordable alternatives in every market we have examined. We discuss alternatives to PVC in selected commercial and institutional markets, including pipes, roofing, floor coverings, and medical gloves, followed by a brief look at residential siding and windows, the largest-volume vinyl building products.

• *Pipes.* Almost half of the PVC manufactured in the US and Canada is used to make pipes and tubing, a diverse category spanning several distinct end uses. For municipal water and sewer pipes, PVC competes with traditional materials including iron, concrete, and vitrified clay, as well as with polyethylene (PE), a less toxic plastic that has a growing share of the market. Sales of PE pipe (for all uses) have reached about one billion pounds annually, compared to 6.5 billion pounds of PVC pipe. PE and traditional pipe materials perform better than PVC in cold climates and under high pressure; in addition, PE pipe is virtually leak-free. Factors like these are often decisive; many municipalities and water companies make decisions based on the desired physical properties of pipes rather than the differences in material prices.

Inside buildings, PVC has become common for electrical conduits and particularly for the "drain/waste/vent" pipes that carry water and waste away. Due to concerns about fire hazards, some building codes limit the use of plastic pipe in multi-story buildings; even where it is allowed, the additional requirements for fireproofing offset much of the apparent cost advantage of PVC pipe.

A case study in Austin, Texas, found that using copper, cast iron, and polyethylene plumbing rather than PVC throughout a large new building increased plumbing costs by 15 percent over all. Costs for small-diameter pipes of several varieties show modest cost differences; PVC has the lowest installed cost in some but not all applications.

• *Roofing.* In roofing, PVC competes primarily with two less toxic synthetic materials, ethylene propylene diene monomer (EPDM) and thermoplastic elastomer polyolefin (TPO), in the market for single-ply (single-layer), low-slope roofs. EPDM is by far the market leader among the three, and PVC is third in sales volume, slightly behind TPO. Advantages claimed for PVC, particularly the fact that it is available in white and therefore provides good reflectivity in hot weather, are equally available with alternative materials. PVC roofing also has a shorter lifetime than most alternatives and presents special technical problems, such as cracking and loss of flexibility under some circumstances.

An analysis of construction costs in Austin, Texas shows that both of the alternatives have lower installed costs than PVC. This is true for a range of membrane thicknesses and modes of installation. These cost relationships are echoed by data from Chicago and western Massachusetts, supporting the view that the differences are not specific to one region or climate.

• *Flooring.* For commercial and institutional flooring, PVC competes with a variety of materials, ranging from natural cork and traditional linoleum to economical synthetic rubber products, and new non-chlorinated polymers that match the look of vinyl. While vinyl flooring has the lowest first cost among the 12 flooring products we examined, its relatively short lifetime and high maintenance requirements outweigh this advantage; it is the most expensive option on a life-cycle basis. An analysis by the US Navy of two flooring options for high-traffic areas on its ships reached the same conclusion: on a life-cycle basis vinyl was far more expensive than Stratica, a durable new polymer. "Green building" efforts have often used linoleum floors as a natural, non-toxic alternative to vinyl, as seen in our case studies; linoleum and other materials provide viable alternatives to vinyl flooring under many circumstances.

• *Gloves.* A variety of disposable medical supplies can be made from PVC. We examine the case of medical gloves. Latex, which for a long time was the standard material of choice for medical examination and surgical gloves, has come to pose a serious health hazard with rising rates of latex

allergies. In this context, health care institutions must move to alternative glove materials; PVC and nitrile are the principal candidates. While PVC gloves are cheaper than nitrile gloves, their lower price is counterbalanced by their lower durability. One study found PVC gloves to have a 30% failure rate under simulated use conditions, compared to 2% for both latex and nitrile. Correction for the failure rate offsets one-third of the apparent cost advantage of PVC over nitrile gloves, based on prices quoted to us by a leading distributor. Kaiser Permanente, the nation's largest not-for-profit health care organization, concluded from its internal review that nitrile gloves were cost-competitive with PVC due to their greater durability, and bought 43 million pairs of nitrile gloves.

- *Siding and windows.* Vinyl is now the most common siding material for low- and moderate-priced housing. However, wood shingles or clapboard also offer viable siding alternatives, as do fiber cement and simulated stucco. Disadvantages to vinyl siding include poor resistance to temperature, vulnerability to water damage, and chemical hazards when it burns or smolders. Despite claims that vinyl is "maintenance free," vinyl can fade with time, can require painting, and can warp. Fiber cement, a relatively new product, is more durable than vinyl and almost as low-maintenance; moreover, fiber cement does not warp or burn.

Alternatives to PVC windows include wood, fiberglass, and aluminum windows. Problems with vinyl windows include sensitivity to high and low temperatures, possible brittleness, and health hazards in case of fire. Vinyl windows can be energy efficient, but they can expand and contract, causing the seal of the window to break; in this case, they cannot be repaired, and must be replaced.

Employment effects of a PVC phaseout

There are 126,000 workers in PVC fabrication plants in the US; we estimate that there are no more than 9,000 workers making vinyl chloride and PVC resin. Replacing PVC with alternatives will change some of these jobs: from fabricating PVC products to fabricating the same products from other materials, most often other plastics; or from making vinyl chloride and PVC resin to making safer substitutes. However, the alternatives are likely to require about the same total employment as production of PVC. In some cases, the same workers who currently make PVC products will be employed making products from PVC alternatives.

Steps toward alternatives

Around the world and throughout the US, a variety of community, state, and national government initiatives have been undertaken to promote the use of safer alternatives to PVC. Many health care institutions have made statements on the need to reduce or eliminate PVC use. The auto industry and other major industries have taken numerous steps to incorporate alternatives to PVC into their products. In addition, countless innovative construction projects have demonstrated the practicality of reducing or eliminating PVC use. Examples discussed here include a green building initiative carried out by a volunteer group, GreenHOME, in partnership with Habitat for Humanity; the Erie Ellington Homes in the Dorchester neighborhood of Boston; the Sheraton Rittenhouse Square Hotel in Philadelphia; and innovative projects by religious communities.

Introduction

Why Worry About PVC?

Polyvinyl chloride has grown from a little-known material with a few specialized uses in the mid-twentieth century (used by the Navy for waterproofing in World War II, for example) to become one of the most widely used plastics today.[1] Thanks to low prices and aggressive marketing, polyvinyl chloride, also known as PVC or "vinyl," has become ubiquitous in our homes and communities. We encounter PVC on a daily basis in products ranging from children's toys, packaging, and lawn furniture to water and sewer pipes, medical equipment, and building materials.

Unfortunately, PVC poses hazards to human health over the course of its life cycle. We review these hazards only briefly here, as other sources present them in detail.[2]

PVC production: Vinyl chloride, the building block from which PVC resin is made, is a classified by the National Toxicology Program as "known to be a human carcinogen," and has been similarly classified as a human carcinogen by other US and international agencies.[3] PVC production exposes workers and communities to vinyl chloride,[4] and many studies have documented links between working in vinyl chloride production facilities and increased likelihood of developing diseases including angiosarcoma of the liver, a rare form of liver cancer.[5] The large numbers of workers in PVC manufacturing facilities, where vinyl chloride exposure is generally lower than in vinyl chloride and PVC resin production, also have an increased likelihood of developing angiosarcoma of the liver.[6] Vinyl chloride and PVC exposure are also associated with certain non-cancer disorders.[7]

PVC use: For most applications, PVC resins are mixed with additives such as stabilizers, plasticizers, and fillers.[8] These additives can leach out of, or volatilize from, a PVC product during the product's useful life. For example, exposure to plasticizers can occur when they volatilize from PVC products, such as building materials; when they leach out of medical equipment during use, exposing patients; and when they leach from soft plastic toys.[9] Phthalates, which are used as plasticizers, may pose hazards to development and reproduction,[10] and have been implicated in the development of respiratory problems in children.[11] Stabilizers that are used in PVC products include lead and other heavy metals.

PVC disposal and accidental burning: When vinyl building materials catch fire—or even smolder, before igniting—they can release acutely toxic hydrochloric acid fumes.[12] At the end of its life, PVC can release toxic substances into the environment when it is burned in an incinerator or rural trash barrel, and can leach toxic stabilizers and plasticizers when it is buried in a landfill. Dioxins, which threaten human health at extraordinarily low concentrations, can be released when PVC is burned, either intentionally or accidentally.[13]

In the face of these and related concerns, vinyl advocates argue that the material offers not only low prices but also amazing convenience. PVC promises to provide "maintenance-free" building exteriors, easily installed pipes and plumbing, low-cost coverings for floors and walls, and all manner of molded or flexible plastic objects. It is widely believed that giving up PVC would impose a painful burden on the economy.

Our principal finding is that this belief is untrue; PVC does *not* offer enormous economic advantages over all other materials. Alternatives providing equal or better performance are available for almost every use of PVC. In some cases, the costs of the alternative materials are already comparable to PVC when costs are measured over the useful life of the product. In other cases, the alternatives are slightly more expensive at present, but are likely to come down in cost as their market share expands. The continued use of PVC offers small short-term gains in some areas, and none at all in others.

In this report, we explore the economics of phasing out PVC. We begin by looking at the uses of PVC today and reviewing past studies of the costs of alternatives to PVC. We then offer four principles for analysis of the alternatives, all of them challenging the economic arguments for continued use of PVC:

- Alternatives that have higher purchase prices, or higher installed costs, than PVC may still be cheaper on a full-cost accounting or life-cycle cost basis.
- Alternatives that look expensive when produced in small batches today will become cheaper when they are mass-produced.
- The unique health and environmental damages caused by PVC can endanger the users of a product, as in the case of medical supplies.

- Academic studies have shown that the costs of environmental protection are routinely overestimated in advance, and decline rapidly after implementation.

We apply these principles in a discussion of alternatives to PVC in major markets, including detailed discussion of pipes, roofing, floor coverings, and medical gloves, and a summary description of the siding and windows markets. Following the analysis of these markets, we examine the expected employment effects of a PVC phaseout and then turn to the steps that have already been taken toward alternatives.

Vinyl Today: A Look at the Market

Sales of PVC grew rapidly in the 1990s, reaching 14.4 billion pounds in the US and Canada in 2002.[14] This is equivalent to 46 pounds for every person in the two countries. PVC sales are much lower in other industrial countries: 31 pounds per person in Western Europe, and 25 pounds per person in Japan. Worldwide production was 59 billion pounds (or almost 27 million metric tons) in 2002, an average of 9 pounds per person. With 5 percent of the world's population, the US and Canada consume 24 percent of the world's PVC.

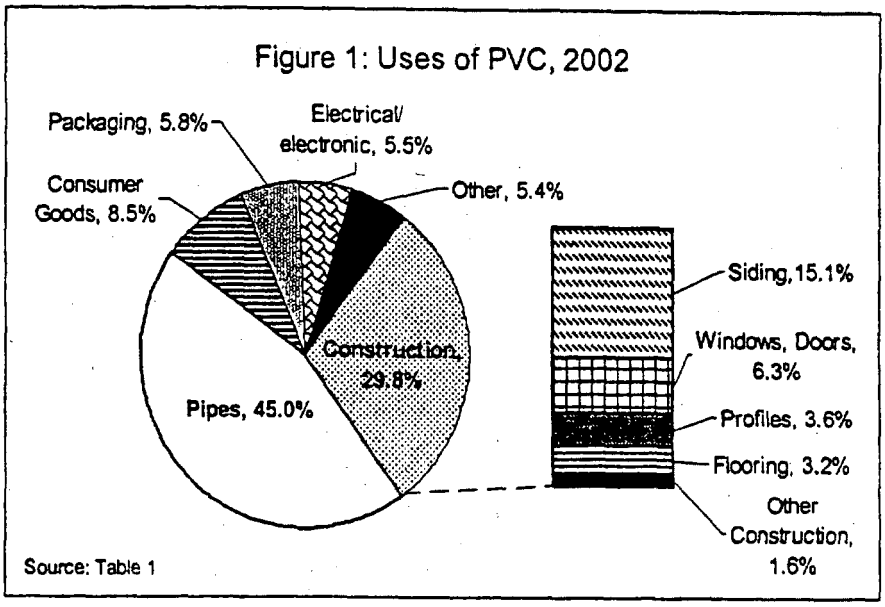
Data on the uses of PVC in the US and Canada for 1994, 1999, 2002, and forecasts for 2007, are shown in Table 1. The 2002 figures are also shown graphically in Figure 1. The principal uses of PVC, in order of importance, are pipes, construction materials, consumer goods, packaging, and electrical products such as wire and cable. Pipes, siding, windows, doors, and profiles (gutters, fences, decks, etc.) together account for more than two-thirds of PVC use, and are also the fastest-growing categories. Many other uses of PVC are growing more slowly, and a few actually declined in the recent economic slowdown. Industry projections for 2007 assume that the recession will end and growth will resume, although at a slower pace than in the 1990s.

Table 1: PVC Consumption in US and Canada, 1994-2007

End Uses	Consumption (millions of pounds)				Annual growth rates		
	1994	1999	2002	2007 est	94-99	99-02	02-07
Pipes, Tubing, Fittings	4,875	6,685	6,494	7,350	7%	-1%	3%
Construction	2,790	3,990	4,293	5,413	7%	2%	5%
Siding	*1,470*	*2,175*	*2,176*	*2,710*	*8%*	*0%*	*4%*
Windows and Doors	*410*	*700*	*910*	*1,225*	*11%*	*9%*	*6%*
Profiles	*225*	*400*	*525*	*775*	*12%*	*9%*	*8%*
Flooring	*440*	*485*	*457*	*455*	*2%*	*-2%*	*0%*
Roofing	*115*	*100*	*100*	*113*	*-3%*	*0%*	*2%*
Other Construction	*130*	*130*	*125*	*135*	*0%*	*-1%*	*2%*
Consumer Goods	915	1,225	1,225	1,225	6%	0%	0%
Packaging	820	885	839	935	2%	-2%	2%
Electrical / Electronic	540	870	800	905	10%	-3%	2%
Transportation	265	310	280	310	3%	-3%	2%
Home Furnishings	185	240	240	240	5%	0%	0%
Other and Inventory	337	128	259	325			
Total	**10,727**	**14,333**	**14,430**	**16,703**	**6.0%**	**0.2%**	**3.0%**

"Other and inventory" includes medical supplies (200 million pounds in 2002), coatings and adhesives (100 million pounds), and inventory changes for the industry as a whole, which can be positive or negative, and vary widely from year to year.

Source: SRI Consulting (Menlo Park, CA), CEH (Chemical Economics Handbook) Marketing Research Report: Polyvinyl Chloride (PVC) Resins (September, 2003).



Costs of Replacing PVC: Three Studies

Three detailed studies, all published in the mid-1990s, have estimated the costs of phasing out PVC.

- The US-Canada International Joint Commission (IJC) for the Great Lakes examined the cost of phasing out PVC as part of its 1993 "Strategy for Virtual Elimination of Persistent Toxic Substances."[15] The report was done for the IJC by a Canadian consulting firm, Hickling Corporation. In 1994, Hickling submitted an expanded and revised version of its study.[16]
- In response to the IJC, the Chlorine Institute asked Charles River Associates (CRA), a US consulting firm, to study the economic benefits of chlorine and related chemicals, including an analysis of PVC.[17]
- In 1997, Environment Canada published a study of options for replacing chlorine-based products, including a detailed look at alternatives to PVC.[18]

These are the most extensive and comprehensive studies on the subject, although by now they are somewhat dated. Moreover, as we will explain, their cost estimates fail to incorporate several important factors that favor the adoption of alternatives. All three found PVC to be only modestly cheaper than the alternatives.

Each of the studies examined many specific uses of PVC, comparing the prices for PVC products to their PVC-free alternatives. Environment Canada created two sets of price comparisons: a low case looking at the least expensive available alternatives, and a high case based on higher-priced alternative products that were in use in Canada.

Table 2 compares the results of the studies. For each study it shows the cost increase that would result from switching to PVC-free alternatives, expressed in dollars per pound of PVC (updated to 2002 prices). Cost estimates are shown separately for pipes and for all other products. Since pipes represent about half of all PVC use, the pipe and non-pipe figures in Table 2 are averaged to obtain a rough estimate of the total cost of replacing PVC.

Table 2: Cost of Replacing PVC

US dollars per pound of PVC (2002 prices)

	CRA (industry)	Hickling (for IJC)	Environment Canada Low	Environment Canada High
Pipes	$1.43	$1.03	$0.15	$0.33
All other uses	$0.87	$1.10	$0.94	$3.84
Average	$1.15	$1.07	$0.55	$2.08

Average is the unweighted average of pipes and "all other uses" estimates
Hickling data excludes windows

Table 2 shows a remarkable degree of agreement between the two earlier studies. With one minor adjustment to the Hickling data (incorporated in Table 2), the CRA and Hickling studies yield nearly identical average costs of replacing PVC—$1.07 to $1.15 per pound.[19] The Environment Canada low case had an average cost of about half this much, due to its much lower estimate for pipe costs. For the non-pipe uses of PVC, there is fairly close agreement

between CRA, Hickling, and the Environment Canada low case ($0.87 to $1.10 per pound).

The Environment Canada study, the most recent of the three, examined 14 product categories that accounted for about 90 percent of PVC use in Canada. In most categories, the study compared costs for PVC products, a common lower-priced alternative, and a common higher-priced alternative (not necessarily the highest or lowest prices on the market). Published in 1997, the study is based on prices and conditions in Canada and construction costs for the Toronto area in 1993. Nine of the 14 product categories were in the areas of pipes and construction materials, as shown in Table 3.

Table 3: Alternatives to PVC in Pipes and Construction

Source: Environment Canada, 1997

End use	Alternative materials		Cost per pound of PVC replaced (US $)	
	Low cost	High cost	Low cost	High cost
Municipal water pipe	HDPE	Ductile iron	$0.26	$0.38
Municipal sewer pipe	HDPE	Concrete		
Drainage pipe, culverts	HDPE	Concrete	($0.05)	$0.25
Drain/waste/vent plumbing	ABS	ABS/Copper		
Industrial pipe, conduits	HDPE			
Siding	Aluminum	Clay brick	$0.38	$6.02
Windows	Wood	Aluminum	($0.82)	$0.38
Flooring	Polyolefin	Ceramic tile/carpet	$13.54	$17.07
Wire and cable	Polyethylenes, other plastics		$3.00	$3.00

1993 Canadian prices converted to US dollars and adjusted for US inflation through 2002.

Separate low- and high-cost alternatives were not estimated for industrial pipe or for wire and cable.

Alternative materials reflect those in use in Canada in 1993, except polyolefin flooring (a polyethylene/polypropylene combination). This product was introduced in Germany in 1996; Environment Canada's low-cost flooring alternative uses the German price.

For pipes, the low-cost alternative to PVC was in each case another plastic, usually high-density polyethylene (HDPE). Traditional pipe materials such as iron, concrete, and copper provided slightly higher-cost alternatives. However, as shown in Table 3, the estimated price per pound of PVC replaced was small for all pipe applications and was actually negative (meaning the alternatives cost less than PVC) for low-cost drain and industrial applications.

The story is more complex for construction materials, where the available options are more diverse and are changing more rapidly than with pipes. For example, Environment Canada's low-cost siding alternative, aluminum siding, has all but disappeared from the market today. (Newer alternatives will be discussed below.) Flooring was the area with by far the highest cost; although it represented only 3 percent of all PVC use in Canada in 1993, it accounted for over half of the cost of the entire low-cost PVC replacement scenario. New flooring products have continued to appear, and some of the best alternatives today were not available at the time of the study.

Over all, the added costs of non-vinyl construction materials were modest: according to Environment Canada, the use of non-PVC alternatives for all four applications—siding, windows, flooring, and wire and cable—would have increased the cost of new residential construction by 0.4 percent in the low case, or 2.4 percent in the high case.

If these estimates applied today, what would they imply for the costs of phasing out PVC? As mentioned above, PVC consumption in 2002 was about 14.4 billion pounds for the US and Canada as a whole, or 46 pounds per person. The Environment Canada low case, the most recent and detailed cost analysis, suggests an average cost increase of $0.55 per pound from switching to alternatives (see Table 2). If this figure still applied, the total cost for replacing all PVC use would be about $8 billion a year for the US and Canada as a whole, or $25 per person.

While it is based on the best available published figures, this calculation has limited applicability

today. Recall that over half of Environment Canada's total cost of alternatives came from a very high estimate for the cost of replacing vinyl flooring. As we will see, better alternatives are available today, with life-cycle costs lower than vinyl flooring. Remove the inflated flooring cost, and Environment Canada's estimate shrinks to less than $4 billion total, or $12 per person. And this is not the only factor tending to lower the cost of alternatives. In the section that follows, we examine several reasons why the cost of a phaseout will probably be even lower than suggested by current prices.

Factors Favoring Phaseout

Although the Environment Canada-based estimates of the costs of a phaseout are still too high, it is worth noting that they are not enormous compared to the North American economy. Affordable housing would not suddenly become unaffordable if, as Environment Canada estimated, replacing the leading uses of vinyl were to raise new residential construction costs by 0.4 percent (and this figure included the inflated flooring cost). Even $8 billion is less than 0.1 percent of the gross domestic product of the US and Canada; with the correction for flooring, the revised $4 billion cost is $12 per capita, less than 0.05 percent of our collective incomes. A loss of this amount, spread across the entire economy, would not cause a noticeable average change in our lifestyles and consumption levels.

Moreover, the estimated cost differences, as described above, overstate the economic benefits of PVC. There are four economic arguments for elimination of PVC, despite its modest cost advantage in some settings at current prices.

Life-Cycle Costs Often Favor Alternatives

Some of the alternatives have higher initial purchase prices than PVC products, but are actually less expensive over the useful life of the product. The three studies described above compared purchase prices, or in some cases installed costs, of PVC and alternatives. Such comparisons may give a misleading impression about the total cost of owning, using, and caring for the products in question.

The total cost over a product's life cycle is the cost that ultimately matters to the user. For example, paper plates are much cheaper than ceramic dinner plates, but households, restaurants, and institutional food services often conclude that it is cheaper in the long run to buy, wash, and reuse ceramic plates, rather than continually buying and discarding paper plates.

The concept of life-cycle costs is no more complicated than this familiar example. Rather than making a decision based on initial costs alone, it is important to compare the full costs, over a period of time, of buying, installing, using, maintaining, and ultimately disposing of alternative products. If a ceramic plate is used daily and is expected to last for a year, then the correct comparison would be the cost of 1 purchase, 365 washings, and 1 disposal versus the cost of buying and disposing of 365 paper plates.[20] As in this case, a more expensive initial purchase may be cheaper in the long run if it lasts longer and/or requires less maintenance or fewer repairs.

For some building materials, such as flooring, maintenance and repair costs can be the largest costs of the product life cycle. In such cases, the lowest-maintenance product is often the cheapest on a life-cycle basis, regardless of whether it has the lowest purchase price. As we will see in a later section, vinyl is the cheapest option for commercial and institutional flooring on a first-cost basis but the most expensive option on a life-cycle basis. When life-cycle costs are taken into account, vinyl flooring loses out to higher-priced but longer-lasting and more easily maintained alternatives.

The discussion of life-cycle costs should not be confused with academic studies known as "life-cycle analyses" (LCAs). A life-cycle cost comparison looks at the costs to the user of a product from purchase through disposal. Life-cycle analysis, on the other hand, attempts to account for all the environmental impacts of a given product, from production through use and disposal. Depending on the data categories that are included, LCAs may provide useful environmental information, but they are not a substitute for a life-cycle cost comparison. Note that life-cycle costs do not directly depend on the environmental impacts included in a LCA; rather, life-cycle costs reflect durability and ease of maintenance, as well as initial costs.

Surprisingly, some LCAs have given PVC relatively good ratings. However, these LCAs often omit the highly toxic and carcinogenic emissions that are the most serious problems associated with PVC.[21] LCAs that include toxic emissions do identify PVC as an undesirable material. The Tellus Institute Packaging Study, an early LCA that evaluated common packaging materials primarily on the basis of life-cycle toxicity, found that PVC was 10 to 12 times worse than other common plastics (which include some of the leading alternatives to PVC). If the Tellus study had used the Vinyl Institute's own estimates of emissions, published at about the same time, instead of the best available public data sources, it would have found that PVC was "only" four times as bad as other plastics.[22]

Mass Production Reduces Costs

Mass production makes everything cheaper. Many PVC products have been produced in huge volumes, making them look cheap today; the production of PVC alternatives could just as easily grow in volume in the future, making them less expensive and more competitive than they are at present. There are two related effects at work here, known as "economies of scale" and "learning curves."

Economies of scale refer to the fact that production costs per unit are often lower when goods are produced in larger batches. There are several reasons why it is cheaper for a big factory to produce large amounts of a single product, compared to smaller plants producing lesser quantities of the same good. Some processes are physically more efficient when performed on a larger scale; a bigger boiler or furnace simply costs less to operate, per unit of heat output, than a small one. In general, a larger scale of production means that more machinery, automation, and standardized procedures can be applied. A company that sells a few hundred plastic objects of a particular shape each year may have workers make them almost by hand, using only basic tools and equipment. A company that sells a few million a year will invest in molding and stamping machines, assembly lines, etc., allowing much faster, labor-saving, lower-cost production.

Learning curves describe the common pattern in which costs decline over time as an industry gains experience with a production process. This is often combined with economies of scale—as industry gains experience, factories also tend to get bigger—but learning curves are possible even if factory sizes do not change. Whenever a new process is introduced, it takes a while to debug it: hence the common, informal advice to avoid version 1.0 of any new software package. Much the same is true for manufacturing. Over time, the bugs are worked out, shortcuts and process improvements are developed, and maintenance procedures and schedules are improved. As a result, costs go down. This phenomenon was first documented in the aircraft industry in the 1930s and has been observed in industries ranging from shipbuilding to wind turbines and photovoltaic cells.[23] A common estimate is that when an industry's cumulative production (the total from the beginning of the industry to the present) doubles, the cost per unit drops by 10 percent to 30 percent. In one classic example, a study found that the Ford Model T dropped in price by 15 percent for every doubling of cumulative production from 1909 to 1923.[24]

The combined effects of economies of scale and learning curves can be seen in the evolution of many consumer electronics products. Cell phones, CD players, DVD players, digital cameras, flat screen computer monitors, and numerous other products started out as expensive and esoteric luxuries and then dropped rapidly in price as the market expanded.

At a certain point, the fact that some people are using a new product means that other people will begin to use it too. For example, if many people have begun to use a new computer program, other people will adopt it simply in order to have a system compatible with that of their colleagues. Conversely, it might be inconvenient to be the only person in a city with an unusual car model, because repairs would be expensive and parts would be hard to find. Thus, for a new technology, the fact that some people have already adopted it eventually becomes a strong argument for further adoptions. By pushing up demand, this pattern creates a snowballing effect that lowers prices and tends to "lock in" the advantage of the product that currently leads the market.[25]

Thus, when a product sells for a relatively low price and is used widely, we cannot assume that it is used widely simply *because* it is cheap. It may, instead, be cheap because it is used widely.

PVC has benefited from mass production in many markets. PVC products have been used for decades, have achieved large sales volume, and thus are mass-produced at low cost. The learning curve effect appears to have been particularly steep for PVC, with every doubling of production associated with a 30 percent to 40 percent drop in price in the 1950s and 1960s.[26] A history of the industry describes a steady stream of process innovations and improvements in production technology in these early years, along with rapid increases in the size of the newest and most efficient plants; these factors undoubtedly drove the price downward.[27]

Many of the less toxic alternatives are not yet firmly established in the market; they do not currently enjoy economies of scale and learning curve advantages comparable to those enjoyed by PVC. In some cases, less toxic alternatives that were once popular may have benefited from economies of scale in the past but have been pushed aside by vinyl and are now produced in relatively small quantities. Linoleum flooring and aluminum siding are examples of this pattern. Analyses of the long-run costs of a PVC-free

future should look beyond the current price of alternative products to their (likely lower) future price as they become widely adopted and mass-produced.

PVC Products Can Be Dangerous to Users

Often the harmful effects of PVC emerge during the intended use of the product. For example, flexible PVC products used in health care, such as IV bags and tubes, contain phthalates—plasticizers that can leach out of the products during use, posing hazards to patients.[28] The US Food and Drug Administration has issued an advisory, for example, recommending measures to reduce patients' exposure to the phthalate Di(2-ethylhexyl)phthalate (DEHP) in medical devices.[29] Phthalates are also used in some flexible PVC toys, including toys that young children are likely to put in their mouths. In 1999, the European Commission adopted an emergency ban on certain phthalate-containing PVC toys and other products, such as teething rings, intended for children to put in their mouths. This ban has been renewed repeatedly, pending development of permanent regulations. Some, though not all, US manufacturers have voluntarily stopped production of PVC toys containing phthalates.[30] (The US Consumer Product Safety Commission has denied petitions to ban PVC in toys for young children or to issue an advisory about hazards associated with these toys.[31])

Additional problems occur when PVC is exposed, intentionally or otherwise, to heat. In case of fire, vinyl building products release large quantities of hydrochloric acid, and smaller quantities of many other toxins, threatening building occupants and neighbors as well as firefighters. For this reason, some firefighter associations are working to educate the public about the hazards of PVC and are supporting municipal and state level policies to reduce PVC use. The International Association of Fire Fighters points out that 165 people died in the Beverly Hills Supper Club Fire of 1977, and 85 people in the MGM Grand Hotel Fire in Las Vegas in 1980—almost all of whom, according to the firefighters, were killed by inhalation of toxic fumes and gases, not by heat, flames, or carbon dioxide. A likely culprit is the hydrochloric acid created by the decomposition of PVC used in wiring and other building materials.[32] Medical researchers have found elevated levels of long-term respiratory and other health problems in firefighters who put out fires involving large quantities of PVC and have identified hydrochloric acid—acting alone or in combination with carbon monoxide and soot—as the probable cause of the damages.[33]

PVC is often advertised as "fire resistant," meaning that a fairly high temperature is required to start it burning. However, PVC starts to smolder and release toxic fumes such as hydrochloric acid at a lower temperature, long before it ignites. If PVC is gradually warmed, more than half of its weight is given off as fumes before it gets hot enough to burst into flames.[34] The hydrochloric acid released by burning PVC is potentially lethal to people caught in a burning building; other products of PVC combustion, such as dioxin, exert their health effects more slowly and are spread across a larger population.

Related hazards occur with PVC-insulated wiring, which was once standard for use in airplanes. There is no proof that PVC insulation has ever caused a plane crash, but some investigators have suggested that there are grounds for concern about older planes that still contain PVC-insulated wires. Full-sized modern airplanes contain 100 or more *miles* of wiring. The insulation on this wiring is critical to air safety: defects in the insulation could allow short circuits and sparks, potentially setting off a fire or explosion. A possible example is ValuJet Flight 592, a DC-9 that crashed in 1996, killing all 110 people on board. Although the flight crew reported an electrical power failure moments before the aircraft crashed, many reports instead focused on the possibility that oxygen tanks on board caused the crash. *Aviation Today* said in a special report on this and another accident,

> The ValuJet Flight 592 accident aircraft was rigged with a type of wire insulation, PVC, that will not pass the FAA's current flame test.... Among PVC wire's unacceptable properties, its burning insulation creates copious amounts of smoke, and the insulation can turn to hydrochloric acid when exposed to moisture. It is found on all DC-9s built through 1975. In addition, the vast majority of 727s...were built with PVC wire. According to an anonymous telephone call to investigators from a self-described company maintenance technician three days after the ValuJet crash, the accident aircraft "was continually having electrical problems...circuit breakers and wiring were shorting out..."[35]

Use of PVC wiring is now prohibited on new planes, since PVC insulation failed Federal Aviation Administration (FAA) flammability tests in 1972.[36]

But as *Aviation Today* noted, many older airplanes that are still flying contain PVC-coated wiring; the FAA never banned its use.[37] The US Air Force discontinued installation of PVC in 1977, although replacing all of the existing wiring at once was too expensive; the schedule for gradual replacement of wiring in some Air Force planes stretches out until 2015.[38] Meanwhile, the potential hazards of older planes continue: there have been at least nine instances of in-flight electrical fires in DC-9 aircraft since 1983, three of which occurred after the ValuJet crash.[39]

In these and similar cases, PVC is an inferior product precisely because of its health and environmental hazards, for those who use it as well as those who make it.

Environmental Protection Costs Less Than Anticipated

The costs of environmental protection are often overestimated in advance. One of the classic examples of this trend actually occurred in PVC production. A strict standard for workplace exposure to vinyl chloride (the raw material from which PVC is made) was established in 1974 by the Occupational Safety and Health Administration (OSHA), following recognition of the likely carcinogenicity of vinyl chloride. Consultants to OSHA estimated the costs of reducing vinyl chloride exposure at around $1 billion; industry estimates were even higher. Actual costs turned out to be around a quarter of OSHA's estimate, since industry quickly developed new, cost-effective technologies to comply with the regulation.[40]

Similar patterns have been found for many environmental standards. One study found that compliance costs for environmental regulations were overestimated in advance in 11 out of 12 cases. Another study found that advance cost estimates for environmental compliance turned out to be more than 25 percent too high in 14 out of 28 cases, while they were more than 25 percent too low in only 3 of the 28 cases.[41] A review of this literature for Environment Canada and the Ontario Ministry of Energy, Science and Technology, focusing specifically on the costs of controlling chlorinated substances, confirmed that overestimation of regulatory costs is more common than underestimation. Among the cases where it found serious overestimation of US regulatory costs were the advance predictions of compliance costs for the Montreal Protocol on ozone-depleting substances and the bans on the toxic pesticides DDT and chlordane/heptachlor.[42]

There are at least three reasons for this repeatedly lighter-than-expected burden. First, economies of scale and learning curve effects are usually not built into prospective cost estimates, but often arise in the production of pollution control devices and cleaner alternative materials. Second, as with vinyl chloride, regulation may stimulate innovation and lead to the introduction of new, more efficient technologies. Finally, overestimation of costs may at times be a bargaining tactic for industry in arguing against environmental protection.

While many of the analyses cited here refer to regulations, often involving traditional end-of-pipe pollution controls, exactly the same factors are at work in the case of clean production alternatives: economies of scale and learning curves will be important, industry will develop new technologies to ease the transition, and the costs of the transition to clean production may be exaggerated in advance for rhetorical or bargaining purposes.

The best-known claims of extraordinary costs imposed by environmental policy do not stand up to careful examination; they turn out to be based on a series of errors and misinterpretations.[43] This has important implications for employment and other economic impacts. Despite rhetorical claims to the contrary, environmental protection has almost never caused noticeable numbers of job losses.[44] Moreover, the critics often forget that environmental initiatives create jobs, many of them skilled blue-collar jobs. The phaseout of PVC is a case in point; the alternatives to PVC are guaranteed to require the efforts of industrial and construction workers. The possible employment implications of a PVC phaseout are examined in a later section of this report.

Steps Toward Alternatives

Many steps have already been taken in the direction of reducing and ultimately eliminating the use of PVC. In this final section we examine three areas where movement away from PVC can already be seen: public policy initiatives in the US and around the world; industry initiatives, including those by auto companies and other leading manufacturers; and a small sampling of the numerous "green building" initiatives in the US. In the first two areas, we rely heavily on an extensive review published by Greenpeace.

Policy Initiatives to Phase out PVC [144]

Here we provide a brief overview of forward-looking policies, initiatives, and strategies that have been adopted by communities, governments, and professional organizations concerned about the health and environmental hazards associated with PVC production, use, and disposal. These efforts include laws, policy statements, strategic plans, and other government initiatives.

US State and Municipal Policies

A number of municipal governments in the US have adopted policies on PVC products. For example, Rahway, New Jersey, prohibits the use of PVC or polystyrene in retail food establishments, requiring the use of degradable packaging. Lake in the Hills, an Illinois town, has banned the use of PVC pipes in construction, due to a variety of practical and safety-related concerns, including worker exposure to glues and solvents during installation. In California, the city of Oakland and Marin County have passed resolutions encouraging the use of PVC-free materials and the use of PVC alternatives in health care institutions, with a long-term goal of phasing out PVC products from health care entirely. Glen Cove, New York, has banned PVC use in eating utensils or food containers in all city food retailers.

A number of states and municipalities have adopted policies on dioxin emissions, some of which include specific references to PVC. San Francisco, Oakland, and Berkeley, California have adopted resolutions to eliminate dioxin, including PVC use reduction as part of a broader strategy. The Rhode Island Department of Environmental Management has adopted a regulation to reduce PVC materials in the waste stream by 50 percent by 2003. New Hampshire has adopted a policy to cut dioxin emissions; the policy specifically discusses use, disposal, and labeling of PVC. Boston has recently adopted a dioxin reduction purchasing resolution that could lead to a reduction in use of PVC products.

Canada

Canada has banned PVC in food packaging and has initiated a public awareness campaign to urge parents not to purchase such toys for small children. British Columbia has made a commitment to the long-term goal of encouraging hospitals to replace PVC with safer materials. The Toronto city government places restrictions on the disposal of PVC products.

US Health Care Organizations

A number of US health care institutions and professional societies of health care providers have adopted resolutions encouraging the elimination of PVC and other products that are important contributors to dioxin formation. The American Public Health Association (APHA) has adopted resolutions to phase out dioxin contributors in medical waste, including PVC products. The Chicago Medical Society, the California Medical Association, and the Minnesota Medical Association have adopted resolutions to investigate PVC alternatives as a means to reduce dioxin emissions from medical waste. The American Nurses' Association and the American Medical Women's Association recommend the reduction of dioxin emissions from medical waste. The member hospitals of the Maine Hospital Association have all committed to continuously reducing the use and disposal of PVC plastic, prioritizing disposable health care and office products as a first step.

The annual CleanMed conference brings together researchers, product vendors, health care purchasers, and others to exchange information on safer health care technologies and to promote the development of healthy markets in these products.[145]

Europe

Sweden was the first country to propose general restrictions on the use of PVC in 1995; restrictions have been enforced since 1999, and the country is working toward discontinuing all PVC uses.

Denmark created a policy in 1996 urging the phaseout of PVC use after the failure of a 1991 voluntary PVC recycling program. One local community in Denmark has restricted the sale of PVC and latex toys and has committed to the reduction of PVC use in hospitals and other institutions. Denmark's Grenaa Hospital has been a world leader in the elimination of PVC, having started a program to replace PVC with safer alternatives as early as 1988. Germany has banned the disposal of PVC in landfills as of 2005, is minimizing the incineration of PVC, and is encouraging the phaseout of PVC products that cannot easily be recycled. Since 1986 at least 274 communities in Germany have enacted restrictions against PVC. The government of the Netherlands has created a policy that requires the use of alternative products for those that have no feasible recycling or reuse system.

Spain's government created a goal in 1995 of reducing PVC packaging by 20 percent by 2000. A number of cities in Spain have developed restrictions on the use of particular PVC products. In addition, 62 cities in Spain have signed on to a "PVC free" agenda, which declares that they will phase out all PVC food packaging and discontinue use of PVC construction materials in government and governmentally funded buildings. In Austria, a number of regional governments have initiated policies that restrict the use of PVC. The capital of Luxembourg recommends that no new PVC piping shall be put in the sewage systems. In Norway, the capital city, Oslo, decided in 1991 to phase out use of PVC in all public buildings. A number of local governments in the United Kingdom have adopted policies to avoid use of PVC windows, and the community of Newhaven has adopted a policy to become entirely PVC free, unless PVC alternatives cannot be procured at a reasonable cost. The Czech Republic has adopted policies to ban the use of PVC food packaging after 2008.

In addition to the policies developed by countries and municipalities, public transportation and utility systems in many countries require the use of PVC-free materials. Public subway and rail systems in Austria, Germany, Spain, and the UK all prohibit the use of PVC cables. The German railways go one step further and avoid the use of any PVC materials. Additionally, water, sewer, and gas companies in the UK are also not using PVC pipes in new or replacement projects.

A number of regulatory initiatives have focused on PVC toys, due to the threat of harm to children if they suck or chew on soft plastic toys. Certain PVC toys and other PVC products for small children have been banned in the European Union as a whole since 1999. Bans on the use of PVC for soft toys have been adopted in many European countries, as well as in other countries including Argentina, Mexico, the Philippines, Tunisia, and the Fiji Islands.

Asia/Pacific

Japan passed a law requiring manufacturers to recycle all packaging material by 2000 in order to reduce dioxin emissions; in response, many manufacturers have switched to non-PVC packaging. Japan has also adopted a policy that limits the use of PVC sheathing in cables used in all governmental and public buildings. An ordinance was also amended to restrict the use of PVC containing toxic additives in cooking utensils and baby toys. Many cities in Japan have adopted, although not necessarily implemented, bans either on all PVC products or on particular PVC products. Singapore has legislated that PVC coated cables are hazardous waste and therefore bans their import under the Basel Convention on Hazardous Waste.

Industry Initiatives [146]

Recognizing the health and environmental reasons to reduce PVC use, and the feasibility of alternatives, many industries—including some very big ones—have begun to shift away from PVC.

Automobiles. A number of car manufacturers have made strong commitments to reducing the use of PVC in their products, often citing environmental, health, and engineering reasons. European manufacturers have taken many steps in this direction. For example, Peugeot in France is reducing PVC use in the interior and exterior of its cars as a way to prevent recycling problems. A number of German car manufacturers have sharply reduced PVC use. Daimler-Benz stopped using PVC in underbody coating and in the interior of all cars as of 1995 and planned to ultimately phase out all PVC use. Opel, the European subsidiary of General Motors, and Mercedes Benz also do not use PVC in car interiors. BMW has adopted material specifications that express a preference for dashboard, trim, and wire coating materials other than PVC, and offers PVC-free dashboards.

Japanese car manufacturers have also taken concrete steps toward reducing PVC use. For example,

Daihatsu Motor Company has established a PVC reduction policy, reducing PVC use in instrument panel padding, roof linings, side moldings, side window linings, the soundproofing component of dashboards, and door trim. The company is investigating ways to reduce PVC use further in side windows, roof fabric, floor undercoating, and wire harness coating. Hino Motors is considering PVC alternatives in truck and bus interiors, exteriors, and wiring systems. Honda made a commitment to replacing PVC interiors by 2003. Mitsubishi is working to substitute PVC in instrument panels and door trim surfaces and already is using alternatives for roof linings and sheet materials. Nissan began using alternatives to PVC in cables in 1997 and is using PVC alternatives for instrument panels, door trim, and side guard moldings and harnesses. Suzuki Motor Corporations is increasing its use of substitutes for PVC, and Toyota has developed PVC alternatives for car interiors and bumpers.

In the US, the world's largest auto manufacturers have also committed to reducing PVC use. General Motors eliminated PVC from its interiors in 1999. The 2000 Pontiac Bonneville used a PVC-free material for the full instrument panel for the first time in North America. Ford has set the target of eliminating the use of PVC by the model year 2006 for all of its plants worldwide and is instructing its suppliers to design vehicles using more recycled content and plastics that are easy to recycle. A number of US auto suppliers have begun their own initiatives to remove PVC and have started by removing it from interior panels, instrument panels, integrating skin, substrate, reinforcing beams, and batteries.

Food Packaging and Water Bottles. The use of PVC in food packaging has been the source of considerable concern in Europe. PVC food packaging is no longer used in Austria, due to measures taken by Austrian supermarket chains in the early 1990s. Carlsberg Italia, the Italian unit of the Danish beer company, has discontinued its use of PVC caps. A number of water bottling companies in Europe have also stopped using PVC in their bottles, including Nestlé brands, Spa, and Evian. In Spain, thirty-six water bottling companies including Danone and Perrier are phasing out PVC.

In Brazil, the agricultural food manufacturer Cargill no longer uses PVC bottles for its Liza soybean oil brand. In Japan, Nihon Suisan Kaisha has converted to PVC-free packaging for its sausages, and Kagome Company has converted to PVC-free packaging for all household products.

In the US, Federated Group, Borden Cremora Non-Dairy Creamers, and Eagle Family Foods have converted to PVC-free packaging for their creamers; Dean Foods is replacing its milk containers with PVC-free packaging; VegiWash has eliminated the use of PVC in its fruit and vegetable wash bottles; and Planters has eliminated its use of PVC bottles for peanut oil.

Hospital Initiatives. Grenaa Central hospital in Denmark has phased out 95 percent of its PVC use. The Glanzing pediatric clinic in the Wilhelminen Hospital in Vienna became the first Neonatal unit in the world to announce in 2003 that it will cease to use PVC products for invasive uses, although some products for non-invasive uses do not yet have a PVC alternative.[147] Glanzing has also introduced PVC-free products in construction, as well as for overshoes, gloves, bed mattresses, and aprons.

In the US, Universal Health Services, the third largest hospital management company, and Tenet Healthcare Corporation, the second largest for-profit health care company, are actively looking to replace PVC medical supplies. Four medical supply purchasing organizations—Broadlane, Consorta Inc, Premier Inc, and Novation—have all committed to reducing the procurement of PVC products and have urged their members to do the same.[148]

The shift to PVC-free medical care products is facilitated by new technological developments. For example, the Japanese company Terumo has begun manufacturing PVC-free dialyzing fluid bags made from polypropylene and has developed a new polypropylene material for continuous ambulatory peritoneal dialysis; McGraw Inc supplies PVC-free IV bags in the US; and Saint-Gobain Performance Plastics has recently developed an alternative to PVC for medical tubing.[149]

Shoes. Nike began to phase out PVC in its products in 2001, and currently advertises several PVC-free footwear models. Nike's website showcases several PVC-free shoe brands, which are labeled with Nike's new environmentally sound logo.[150] Other manufacturers, including Adidas, Asics, and Puma, are also in the process of phasing out PVC in shoes.[151]

Electronics. Sony states in its 2003 *Corporate Social Responsibility Report* that the company is working to reduce PVC in all its products by the end of 2005.[152] Sony now has PVC-free headphone cords, speaker boxes, and disk drives on the market.[153] Recently, Sony released two products in the Tokyo market that

replace PVC with the corn-based polymer polylactic acid (PLA): a DVD player and AIBO, a robotic pet.[154] Toshiba is currently working to phase out the use of halogenated compounds, including PVC, from its circuit boards.[155]

Furniture. The Swedish furniture retailer IKEA, well-known across Europe and the United States, started phasing out PVC use in September of 1992. To date IKEA has eliminated PVC from all furniture, and plans to phase out PVC in its lamp wiring by 2006.[156]

Retailing. Marks and Spencer, one of the largest retailers in Great Britain, pledged in 2001 to phase out the use of PVC in its products, focusing initially on food packaging.[157]

Innovative Construction Projects

There has been an explosion of interest in environmentally sound construction in the US in recent years. A wealth of information on green building initiatives, including many case studies of individual building projects, is available through the US Green Buildings Council. Initiatives showcased by the council address a range of environmental and health concerns, including energy efficiency, environmentally sound management of wastes, and creating buildings with good indoor air quality. [158]

The Healthy Building Network (HBN) provides a clearinghouse of information and contacts on PVC-free and other environmentally preferable building practices. HBN has also collected case studies of building initiatives that have used safe construction materials, including a number of health care institutions that have undertaken green building projects. To cite just one example, Beth Israel Medical Center in New York City completed a set of interior renovations in 2000. Among other steps to ensure environmental safety and protect indoor air quality, Beth Israel excluded PVC from its construction and furniture specifications.[159]

In this section, we highlight just a few of the growing number of innovative construction projects in which special efforts have been made to choose materials that are safe for human health and the environment, while keeping costs low. All of the examples discussed here have reduced or eliminated the use of PVC.

GreenHOME, a volunteer group, partnered with the Washington, DC chapter of Habitat for Humanity to design and build a low-income home that is energy efficient and built from materials that are safe for human health and the environment.[160] The purpose of the project was to demonstrate that green building is not only an option for luxury homes; it is equally possible for home builders on a budget. After exhaustive research on materials, the group constructed a home whose total cost was $75,000.

The GreenHOME house is not 100 percent free of vinyl, but the use of vinyl was kept to a minimum. The windows of the house are vinyl-clad wood and cost $264 each. The siding is Hardiplank (a fiber cement product), purchased at $0.55 per linear foot, for a total cost of $2,534. For flooring, the project used salvaged wood floors for living room areas and natural linoleum for the kitchen. The total cost of flooring was $4,221. For roofing, the material of choice was 100 percent recycled aluminum shingles, at a cost of $1,464.

Another good model of green building on a budget is the **Erie Ellington Homes** project in Dorchester, Massachusetts.[161] Developed by the Codman Square Neighborhood Development Corporation with technical assistance provided by the Hickory Consortium (Bruce Hampton, AIA, architect), this project includes fifty high-energy-efficiency housing units. The builders used fiber cement clapboards instead of vinyl and high-quality recycled content aluminum clad wood windows instead of vinyl clad windows.

One goal of the project was to provide safe homes for children and adults with asthma, by avoiding building materials that are associated with air quality problems. Although not definitive, early results suggest that the project has had some success in this regard; interviews with new residents have shown that symptoms were noticeably reduced in 8 out of 18 asthma sufferers.

To save money, the project used vinyl composite tile in some public areas, such as common halls and stairs; these were selected as areas in which outgassing of phthalates would be least likely to affect occupants. For some other areas the project used alternative flooring products, including linoleum.

Both the Erie Ellington project and the GreenHOME project used Hardiplank, a durable fiber cement siding product that requires very infrequent painting. The GreenHOME project estimates that the Hardiplank siding will require painting "every 15 to 20 years, compared to every 5 to 10 years for wood

siding in the Washington, DC climate."[162] Managers of both projects seem to have been relatively satisfied with Hardiplank. The principal disadvantage of the material for the GreenHOME project, which relied largely on volunteer labor, is that Hardiplank is somewhat more difficult for volunteers to work with than vinyl. The project report notes that cutting the planks created large amounts of dust, so that volunteers had to wear filtration masks. Dust would have been reduced if the project had used special tools for cutting the Hardiplank, but these tools were out of the price range of the project. In addition, because it is more dense than wood, the Hardiplank siding was more difficult to nail into place than wood siding would have been. The GreenHOME project report concludes that overall, "these problems were minor and acceptable."[163]

The **Sheraton Rittenhouse Square Hotel** in Philadelphia advertises itself as an "environmentally smart hotel."[164] The hotel has wallpaper with a water-based finish instead of vinyl wall coverings. Carpeting in the hotel does not have a PVC base. For flooring in non-carpeted areas, the hotel has used natural linoleum instead of vinyl tile. The hotel plumbing includes no PVC pipe.

Barry Dimson, co-owner of the hotel, has made the economic case for building environmentally sound hotels in a series of articles. He argues that up-front costs for building an environmentally sound hotel, using safe building materials, are not significantly different from the cost of building a "traditional" hotel, where air quality may be poor due to mold and off gassing from PVC and other building materials. Dimson notes that an estimated 20 percent of total project cost in the construction of a new hotel is land acquisition, and around 55 percent is "the 'hard' cost of construction, with 'soft' costs such as carrying charges and design fees comprising the remaining 25 percent." If half of the "hard cost" of construction is dedicated to excavation, foundations, and superstructure, then just half the construction cost is dedicated to "the building's 'skin,' mechanical equipment, [and] building materials." This 27.5 percent is the portion that is affected by green building considerations. Thus, argues Dimson, "even if [green building materials] cost 10 percent more up front, 10 percent of 27.5 percent represents a premium of [just] 2.75 percent over the total cost."[165]

Green building was prioritized in construction of a new building for **Adat Shalom**, a synagogue in Bethesda, Maryland.[166] Among other choices, the community chose to use cork instead of vinyl flooring wherever possible. Since finishing construction of the new building, members of Adat Shalom have been working with others to spread knowledge of best practices for green buildings in religious communities. The "Building in Good Faith" initiative, launched by filmmaker Judith Helfand and religious leaders, asks faith-based institutions to reduce their purchasing and use of toxic building materials, particularly those made from PVC.[167]

Conclusion

PVC has become universal, used in every area of modern life. It is said to be cheap, convenient, safe, and maintenance free. Our review of the evidence finds that the advantages of PVC are often overstated—it is a little cheaper than the alternatives in some areas, but no bargain at all in others. Our analysis offers four categories of responses to the economic argument for PVC:

- It is not always cheaper on a life-cycle cost basis, as in flooring.
- The alternatives will become cheaper over time, due to economies of scale and learning curve effects.
- The use of PVC products often poses health and safety hazards, as in medical supplies.
- The costs of environmental protection and improvement are routinely overstated in advance.

In our look at specific markets, we found that less toxic alternatives are successfully competing with PVC in many pipe applications, in single-ply roofing, in flooring on a life-cycle cost basis, and in medical supplies due to growing concerns about the health hazards of PVC. In siding and windows, among the fastest-growing vinyl markets of recent years, promising new alternatives have appeared.

The employment effects of a transition to alternative materials may be modest. PVC will be replaced by other materials that also require labor; workers will still be needed to make the substitute products. In some cases, the same factories and workers may fabricate the same products from new materials.

There are policy initiatives at every level, internationally and within the US, calling for reduction and restriction of PVC use. Major industries are beginning to substitute less toxic materials for PVC throughout their product lines. The rapidly growing "green building" movement has created numerous successful examples of the use of safer alternatives materials; the few examples described here are only a sample of the encouraging diversity of approaches emerging in the construction industry today.

Our review of PVC uses and alternatives makes it clear that a PVC phaseout is achievable and affordable. The alternatives are increasingly well known and well developed, and in many cases are already cost-competitive with PVC. It is realistic and practical to build health and environmental considerations into materials choice for municipal infrastructure, commercial and residential building, medical supplies, and consumer products. The cost impacts of substitution will be modest, and will grow smaller over time.

Endnotes

[1] For an overview of PVC's history, see Peter H. Spitz, *Petrochemicals: The Rise of an Industry* (New York: John Wiley and Sons, 1988).

[2] For an overview of current information and references on health hazards associated with PVC production, use, and disposal, see the affidavit of Judith Schreiber, PhD, Senior Public Health Scientist, New York State Office of the Attorney General, provided to the Supreme Court of the State of New York, In the Matter of the Application of Resilient Floor Covering Institute and Tarkett, Inc, vs. New York State Department of Environmental Conservation, Index Number 6721-02, May 9, 2003, available at http://www.healthybuilding.net/documents/Affidavit-of-Judith-Schreiber-Ph-D.pdf, viewed December 2003. Our review draws on the summary provided by Schreiber and references therein. Also see Joe Thornton, *Pandora's Poison: Chlorine, Health, and a New Environmental Strategy* (Cambridge, MA: MIT Press, 2000).

[3] US Department of Health and Human Services, Public Health Service, National Toxicology Program, *Report on Carcinogens, Tenth Edition* (December 2002), available at http://ehp.niehs.nih.gov/roc/toc10.html, viewed November 2003. Also see US Environmental Protection Agency, "Vinyl Chloride Hazard Summary" (2002) and International Agency for Research on Cancer International Agency for Research on Cancer, "Overall evaluations of carcinogenicity: An updating of IARC monographs, Volumes 1 to 42," *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Supplement 7,* (Lyon, France: IARC, 1987), pp. 373-376, cited in Schreiber 2003.

[4] On routes of human exposure to vinyl chloride, see Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile for Vinyl Chloride* (September 1997, CAS # 75-01-4), p. 153ff, available at http://www.atsdr.cdc.gov/toxprofiles/tp20.html, viewed December 2003.

[5] See the literature review in ATSDR 1997, pp. 54-60, and studies cited in Schreiber 2003, point 12.

[6] See C. Maltoni, "Two Cases of Liver Angiosarcoma among PVC Extruders of an Italian Factory Producing PVC Bags and Other Containers," *American Journal of Industrial Medicine* 5: 297-302 (1984); J. Kielhorn, "Vinyl Chloride: Still a Cause for Concern," *Environmental Health Perspectives* 108:7 (2000); and R. H. Wong, "An increased mortality ratio for liver cancer among polyvinyl chloride workers in Taiwan," *Occupational and Environmental Medicine* 59 (2002), 405-409, all cited in Schreiber 2003.

[7] See Schreiber 2003, points 17 and 18.

[8] On use and health effects of PVC additives, see Schreiber 2003, points 21-25. On use of plasticizers in medical equipment, also see Joel Tickner, "The Use of Di-2-Ethylhexyl Phthalate in PVC Medical Devices: Exposure, Toxicity, and Alternatives," (University of Massachusetts Lowell: Lowell Center for Sustainable Production, no date).

[9] See our later sections on flooring and on medical supplies for additional discussion of plasticizer exposure through these routes.

[10] See National Toxicology Program and Center for the Evaluation of Risks to Human Reproduction, *NTP-CERHR Expert Panel Report on Di(2-ethylhexyl) phthalate* (NTP-CERHR-DEHP-00) (October 2000), available at http://cerhr.niehs.nih.gov/news/phthalates/DEHP-final.pdf, viewed December 2003.

[11] See Jouri J. K. Jaakola et al., "Interior Surface Materials in the Home and the Development of Bronchial Obstruction in Young Children in Oslo, Norway," *American Journal of Public Health* 89:2 (February 1999), 188-192.

[12] See Schreiber 2003, point 35. Also see Robert F. Dyer and Victor H. Esch, "Polyvinyl Chloride Toxicity in Fires: Hydrogen Chloride Toxicity in Fire Fighters," *Journal of the American Medical Association* 235 no. 4 (1976), pp.393-397; Jeffrey S. Markowitz, Elane M. Gutterman, Sharon Schwartz, Bruce Link, and Sheila M. Gorman, "Acute Health Effects Among Firefighters Exposed to a Polyvinyl Chloride (PVC) Fire," *American Journal of Epidemiology* 129 no. 5 (1989), pp.1023-1031.

[13] See Thornton 2000, especially pp. 271, 276, and 316-319, and references therein. Also see Schreiber 2003, point 30.

[14] All figures in this paragraph are calculated from Eric Linak with Kazuo Yagi, "Polyvinyl Chloride (PVC) Resins," Chemical Economics Handbook Marketing Research Report (Menlo Park, CA: SRI International, September, 2003).

[15] International Joint Commission, "A Strategy for Virtual Elimination of Persistent Toxic Substances" (Windsor, Ontario, 1993).

[16] Hickling Corporation, "Economic Instruments for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes Basin," report to International Joint Commission (Windsor, Ontario, 1994).

[17] Charles River Associates, Inc., "Assessment of the Economic Benefits of Chlor-Alkali Chemicals to the United States and Canadian Economy" (Boston, 1993).
[18] Environment Canada, "A Technical and Socio-Economic Comparison of Options to Products Derived from the Chlor-Alkali Industry" (1997).
[19] The adjustment is that Table 2 omits Hickling's data on windows; Hickling estimated that implausibly large savings were available from replacing PVC windows with aluminum windows. Thus our adjustment increased the Hickling cost estimate for replacing PVC.
[20] These are purely hypothetical numbers for illustrative purposes, not real data. In reality, of course, ceramic plates often last much more than a year, increasing their attractiveness relative to paper plates.
[21] LCAs frequently emphasize energy use, carbon dioxide emissions, and criteria pollutants, since these categories are often better documented than toxic emissions. For a comparative analysis of recent LCA studies of PVC, highlighting their differences in data coverage, see Eric Copius Peereboom, Rene Kleijn, Saul Lemkowitz, and Sven Lundie, "Influence of Inventory Data Sets on Life-Cycle Assessment Results: A Case Study on PVC," *Journal of Industrial Ecology* 2 no. 3 (1999), pp.109-130.
[22] *Tellus Institute Packaging Study* (Boston: Tellus Institute, 1992). For a brief overview of this massive study, see Frank Ackerman, *Why Do We Recycle? Markets, Values, and Public Policy* (Washington DC: Island Press, 1997), Chapter 5.
[23] For detailed formulae used to calculate learning curve effects, see the "Learning Curve Calculator," available at http://www.jsc.nasa.gov/bu2/learn.html (viewed February, 2003). On the economic theory of learning curves, see, for example, A. Michael Spence, "Investment Strategy and Growth in a New Market," *The Bell Journal of Economics* 10 no. 1 (Spring, 1979), pp. 1-19; Steven Klepper and Elizabeth Graddy, "The Evolution of New Industries and the Determinants of Market Structure," *The RAND Journal of Economics* 21 no. 1 (Spring, 1990), pp. 27-44; and Pankaj Ghemawat and A. Michael Spence, "Learning Curve Spillovers and Market Performance," *Quarterly Journal of Economics* 100 Supplement (1985), pp. 839-852.
[24] In that period, cumulative production of the Model T went from less than 20,000 to about 7 million cars, doubling more than eight times. W. J. Abernathy and K.Wayne, "Limits of the Learning Curve," *Harvard Business Review* 52 no. 5 (1974), pp.109-119.
[25] Brian W. Arthur, an economist at the Santa Fe Institute, has argued that many of society's important economic and technological choices are "path dependent." A technology that, perhaps accidentally, gains a slight lead early in its history may be able to solidify that lead by gaining market share and lowering prices, "locking out" other technologies that may be equally or more efficient if adopted on a large scale. The Windows operating system, the standard videocassette format, the dominant nuclear reactor design, and the gasoline-powered automobile engine, for example, all started with only small leads over equally (or more) attractive rival technologies; all have come to be "locked in" and dominate their markets through the path-dependent process that Arthur describes. See Brian W. Arthur, *Increasing Returns and Path Dependence in the Economy* (Ann Arbor: University of Michigan Press, 1994).
[26] Our calculation from the graph in Peter H. Spitz, *Petrochemicals: The Rise of an Industry* (New York: John Wiley and Sons, 1988), p.415. Spitz presents separate graphs of cumulative production vs. price for PVC and copolymers, for value added by polymerizer, and for vinyl chloride monomer. In these three graphs, a doubling of cumulative production is associated with price declines of 34 percent, 31 percent, and 40 percent, respectively.
[27] Spitz (1988), pp.390-417.
[28] See Joel Tickner (no date).
[29] US Food and Drug Administration, "FDA Public Health Notification: PVC Devices Containing the Plasticizer DEHP," (July 12, 2002), available at http://www.fda.gov/cdrh/safety/dehp.html (viewed September, 2003).
[30] For a survey of toy manufacturers' actions on PVC toys, see the Greenpeace Toy Report Card, available at http://greenpeaceusa.org/bin/view.fpl/7434/article/287.html (viewed November, 2003).
[31] See US Consumer Product Safety Commission, "Re: Petition Requesting Ban of Use of Polyvinyl Chloride (PVC) in Products Intended for Children Five Years of Age and Under," letter to National Environmental Trust and other groups (February 26, 2003), available at http://www.cpsc.gov/LIBRARY/FOIA/FOIA03/petition/Ageunder.pdf (viewed November, 2003).
[32] "Hazardous Materials: Polyvinyl Chloride," International Association of Fire Fighters, AFL-CIO, CLC (Washington DC, 1995). For a detailed literature review of health impacts of PVC, including combustion impacts, see the affidavit of Judith Schreiber before the Supreme Court of the State of New York in the matter of *Resilient Floor Covering Institute v. New York State Department of Environmental Conservation* (2003), available at http://www.healthybuilding.net/pvc/NYS_vinyl_affidavit_js.pdf (viewed September, 2003).

[123] Comfort Line Inc., "The right choice...Fiberglass!"
[124] On the carcinogenicity of fibrous glass products, see US Department of Health and Human Services, Public Health Service, National Toxicology Program, "10th Report on Carcinogens, Tenth Edition" (December 2002), available at http://ehp.niehs.nih.gov/roc/toc10.html#toc (viewed November 2003). For an overview of occupational hazards, see American Lung Association of Georgia, "Facts About Fiberglass," available at http://abrannen.home.mindspring.com/alag/fbrglass.htm (viewed September, 2003). For a history of science and policy on fiberglass, see Peter Montague, "A Carcinogen that is Everywhere," *Rachel's Environment and Health News* #444 (June 1, 1995), available at http://www.rachel.org/bulletin/index.cfm?issue_ID=681 (viewed November 2003).
[125] Cramer, Oneida, "Window Restoration," available at http://www.homeissues.com/viewarticle.cgi?article=152&category=3 (viewed September 26, 2003).
[126] BobVilla.com.
[127] Comfort Line Inc. "The right choice...Fiberglass!"
[128] See Cramer, Oneida; John Paquette, "What's Wrong with Vinyl Windows?" East Row Historic District, Newport, KY, available at http://eastrow.org/articles/vinylwindows.html (viewed October 2, 2003).
[129] Ross, Mickey, President Ross Window Corp, "New Windows Give a 'Green' Outlook," New York Association of Realty Managers, available at http://www.nyarm.com/oct00/windows.html (viewed September 26, 2003).
[130] Comfort Line Inc. "The right choice...Fiberglass!"
[131] Prices from 5 Points Sash and Doors employee, personal communication (September 26, 2003).
[132] The total employment in NAICS industry 3261, "plastics product manufacturing," was 826,615. Of these workers, 526,382, well over half, were described only as being in industry 326199, "all other plastics product manufacturing." See http://www.census.gov/epcd/ec97/us/US000_31.HTM#N326.
[133] SPI, *Size and Impact of the U.S. Plastics Industry*, as described on http://www.plasticsdatasource.org/impact.htm.
[134] http://www.chlorallies.org/employ.html (viewed October 7, 2003).The data refer to a recent but unspecified year.
[135] SRI Consulting (Menlo Park, CA), *Chemical Economics Handbook: Vinyl Chloride Monomer* (December, 2000), and *CEH Marketing Research Report: Polyvinyl Chloride (PVC) Resins* (September, 2003).
[136] It seems likely that the employment data in Table 17 err more often in the direction of including too many workers, such as those who make other products at the same plants. The one obvious case of incompleteness in the other direction, underestimating employment, seems smaller by comparison. If too many workers are counted in Table 17, then the true average productivity—pounds of PVC per worker—is higher than our estimated 2.82 million pounds per worker, and the number of workers needed to produce the entire industry output is lower than 5,600. Further support for the guess that the industry has higher productivity, and hence lower total employment, than our estimates can be found in Environment Canada's study of chlorine-related industries in Canada in 1993. That study describes three PVC resin plants, with an average capacity of 3.14 million pounds per worker. If there have been advances in productivity since 1993, the capacity per worker should now be even higher. See Environment Canada, "A Technical and Socio-Economic Comparison of Options to Products Derived from the Chlor-Alkali Industry" (1997), Chapter 9.
[137] The 200 workers were also producing a larger quantity of EDC, a VCM precursor; some of the EDC was exported, and some was used to produce VCM. Thus the workers' actual productivity was higher (and estimated US labor requirements per million pounds of VCM should be lower) than the numbers presented in the text.
[138] PVC Container Company, Eatontown, NJ, interview with sales representative (October 28, 2003).
[139] Omni International (Bedford, NH), High Five, and Kimberly Clark company representatives, personal communications (October, 2003).
[140] Information on Westlake is drawn from Westlake's website, at http://www.westlakegroup.com/index2.html (viewed November, 2003).
[141] CertainTeed website, http://www.certainteed.com (viewed November, 2003).
[142] Calculated from the Bureau of Labor Statistics, Job Openings and Labor Turnover Survey, Tables 4 and 6, available at http:www.bls.gov/jlt/ (viewed October 8, 2003).
[143] See the discussion of the Just-Transition program in Frank Ackerman and Rachel Massey, "Prospering With Precaution" (2002), available at http://www.ase.tufts.edu/gdae/policy_research/PrecautionAHTAug02.pdf. On the Just Transition program, see James P. Barrett and J. Andrew Hoerner, "Clean Energy and Jobs: A Comprehensive Approach to Climate Change and Energy Policy" (Washington, DC: Economic Policy Institute, 2002).
[144] Most of the information presented in this section is drawn from Greenpeace International, "PVC-Free Future: A Review of Restrictions and PVC free Policies Worldwide, 8th Edition" (2001) and Washington Toxics Coalition, "Anti-Vinyl, -PBT and –Dioxin Resolutions Adopted Across America and Around the World" (2002).

[145] See http://www.cleanmed.org.
[146] Unless otherwise noted, all information in this section is from Greenpeace (2001).
[147] Health Care Without Harm, "Glanzing Clinic in Vienna is First PVC-Free Pediatric Unit Worldwide," Press release (June 13, 2003).
[148] "Four Top Hospital Group Purchasers to Cut Mercury, PVC," *Waste News* (November 5, 2002).
[149] Saint-Gobain Performance Plastics, "TYGON® Medical Plasticizer-Free Tubing Developed Specifically for DEHP-Plasticizer and PVC Replacement in Medical Applications" (no date).
[150] See http://www.nike.com/nikebiz/nikebiz.jhtml?page=27&cat=sustainable (viewed November, 2003). Follow the "PVC-free" link and click "close" in the first panel to see details on current PVC-free shoe brands.
[151] "Athletic shoe makers had better leave stockings and not shoes out for Santa this Christmas, suggests Greenpeace," *Pesticide & Toxic Chemical News* 30 no. 8 (Dec 17, 2001), p.28.
[152] Sony Corporation, "Sony and the Global Environment," available at http://www.sony.net/SonyInfo/Environment/environment/communication/report/2003/pdf/e_2003_05.pdf (viewed November, 2003).
[153] See promotional materials at http://www.sony.net/SonyInfo/Environment/environment/communication/advertisement/08 (viewed November, 2003).
[154] US Grains Council, "Global Update" (March 14, 2003), available at http://www.grains.org/news/global_updates/glo-03-14-03.pdf (viewed November, 2003). It is worth noting that PLA is currently manufactured by Cargill from genetically engineered corn, which itself poses environmental hazards. Plant-based polymers can be produced sustainably in principle and do not require genetic engineering for their production.
[155] See company information at http://www.toshiba.co.jp/env/english/04/index3.htm (viewed November, 2003).
[156] IKEA Press Room, "IKEA CEO speaks at a Greenpeace conference in London," (October 10, 2001), available at http://www.ikea.com/about_ikea/press_room/press_release_int.asp?pr_id=492 (viewed November, 2003).
[157] See http://www2.marksandspencer.com/thecompany/mediacentre/corporatesocialresponsibility/2001.shtml (viewed November, 2003).
[158] For case studies on green buildings, see http://www.usgbc.org/Resources/links.asp#4 (viewed November, 2003).
[159] Healthy Building Network, "Green Healthcare Construction Case Studies," available at http://www.healthybuilding.net/healthcare/Green_Healthcare_Case_Studies.pdf (viewed November, 2003).
[160] Brett Goldstein, ed., *Green and Lean: Designing and Building an Affordable, Resource-Efficient Home* (Washington, DC: Green Home, 2000).
[161] Information on Erie Ellington Homes is available at Hickory Consortium, "Erie Ellington, Dorchester, Massachusetts," available at http://www.hickoryconsortium.org/erie_ellington.htm (viewed July, 2002). Additional information was provided by Bruce Hampton, Architect, Hickory Consortium, personal communication (November, 2003).
[162] Goldstein (2000) p.29.
[163] *Ibid.*
[164] Information on the Rittenhouse Sheraton is from Barry Dimson, co-owner, personal communication (September, 2002); also see www.sheraton.com\philadelphiarittenhouse.
[165] Barry H. Dimson, "The Economics of Green Hotels," (January 23, 2002).
[166] See the Adat Shalom website at http://adatshalom.net, which is the source for this account.
[167] See http://www.myhouseisyourhouse.org/ for information on Building in Good Faith.

DIVISION OF CORPORATION FINANCE
INFORMAL PROCEDURES REGARDING SHAREHOLDER PROPOSALS

The Division of Corporation Finance believes that its responsibility with respect to matters arising under Rule 14a-8 [17 CFR 240.14a-8], as with other matters under the proxy rules, is to aid those who must comply with the rule by offering informal advice and suggestions and to determine, initially, whether or not it may be appropriate in a particular matter to recommend enforcement action to the Commission. In connection with a shareholder proposal under Rule 14a-8, the Division's staff considers the information furnished to it by the Company in support of its intention to exclude the proposals from the Company's proxy materials, as well as any information furnished by the proponent or the proponent's representative.

Although Rule 14a-8(k) does not require any communications from shareholders to the Commission's staff, the staff will always consider information concerning alleged violations of the statutes administered by the Commission, including argument as to whether or not activities proposed to be taken would be violative of the statute or rule involved. The receipt by the staff of such information, however, should not be construed as changing the staff's informal procedures and proxy review into a formal or adversary procedure.

It is important to note that the staff's and Commission's no-action responses to Rule 14a-8(j) submissions reflect only informal views. The determinations reached in these no-action letters do not and cannot adjudicate the merits of a company's position with respect to the proposal. Only a court such as a U.S. District Court can decide whether a company is obligated to include shareholder proposals in its proxy materials. Accordingly a discretionary determination not to recommend or take Commission enforcement action, does not preclude a proponent, or any shareholder of a company, from pursuing any rights he or she may have against the company in court, should the management omit the proposal from the company's proxy material.

February 13, 2004

Response of the Office of Chief Counsel
Division of Corporation Finance

Re: The Dow Chemical Company
Incoming letter dated December 30, 2003

The proposal requests that the board of directors publish a report related to certain toxic substances, including a "range of projected costs of remediation or liability" for Midland, Michigan, Agent Orange, and each of the other material toxic sites facing the company.

There appears to be some basis for your view that Dow Chemical may exclude the proposal under rule 14a-8(i)(7), as relating to its ordinary business operations (i.e., evaluation of risks and liabilities). Accordingly, we will not recommend enforcement action to the Commission if Dow Chemical omits the proposal from its proxy materials in reliance on rule 14a-8(i)(7). In reaching this position, we have not found it necessary to address the alternative basis for omission upon which Dow Chemical relies.

Sincerely,

John J. Mahon
Attorney-Advisor