A New Environmental Accountability System For the Nanotechnology Industry

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ABSTRACT

The United States has long relied on government regulation as the principal means of holding companies accountable for their environmental behavior. This approach is unlikely to work well for the nanotechnology industry. Instead, the fact that nanotechnology is a new industry, its rapid evolution, the level of scientific uncertainty associated with the impacts of the technology and the potentially transformative benefits of the technology all make the industry a good candidate for implementing a new system of environmental accountability. In addition to more adaptable government regulation, this accountability system should include wider access to information, enhanced involvement by a wide range of stakeholders and a better understanding of the steps the industry must take to build and maintain public confidence.

Keywords: environmental accountability, regulation, transparency, dialogue, liability

1 INTRODUCTION

Because nanotechnologies are different in kind from the technologies with which environmental regulators are familiar they require a different approach to environmental management. Historically, the United States and many other countries have relied on a government-based regulatory system that has focused primarily on reducing end-of-the pipe emissions from larger industrial facilities or regulation of hazardous wastes as the principle methods of holding industries accountable for the environmental and public health consequences of their activities and products. As one commentator has noted, environmental regulators have applied 20th century approaches (primarily command and control regulations) to regulate 19th century technologies, such as industrial boilers, metal plating operations, and waste water treatment plants. This approach has been successful in dealing with some of the most egregious water, air and soil pollution problems of the past. However, it is inadequate as the principal management approach for the nanotechnology industry for several reasons including:

- the speed at which nanotechnologies are developing;
- the competitive pressures to move technology quickly in to the market place;
- the limited resources available to government regulators;
- the difficulty in enacting new federal environmental legislation;
- the level of scientific uncertainty and the complex risks involved with nanotechnology;
- the difficulty in monitoring nano-scale releases; and
- the importance to the industry of maintaining public confidence.

Government agencies, the nano-technology industry, advocacy organizations and other stakeholders should consider employing a much wider range of accountability mechanisms to create a sustainable and reliable system that assures public health and environment protection while facilitating the growth of the fledgling, but potentially transformative industry. The new accountability system must include governmental regulatory measures but also must incorporate economic measures and values to shape desired outcomes [1].

2 ENVIRONMENTAL ACCOUNTABIILTY

"Environmental accountability [2]" is a concept that incorporates a broad range of mechanisms designed to expose the environmental behavior of organizations to public scrutiny creating a sense of responsibility to improve environmental behavior, providing economic incentives to improve environmental behavior, and establishing legal obligations to improve environmental behavior. These mechanisms include:

- the traditional regulatory and enforcement system;
- new approaches to regulation including more flexible performance-based standards;
- economic instruments and product standards;
- enhanced monitoring and required public reporting;
- liability standards;
- voluntary industry leadership programs and public reporting protocols;
- improved public education;
- corporate social responsibility programs; and
- stakeholder dialogues

Instead of relying primarily upon regulations imposed by government, an environmental accountability regime deploys a variety of mechanisms. Some are imposed by government; others are voluntarily adopted by, or acquiesced to by affected organizations based on a recognition that it is in their self-interest to cooperate; while still others result from economic pressure from customers and investors. Relying on a broad based environmental accountability regime may be essential to the success of the

nanotechnology industry—both as a commercial enterprise and in protecting public health and the environment—for at least three reasons.

2.1 Need for Flexible and Protective Regulations

Nanotechnology is likely to evolve rapidly, with new processes and products moving from the development stage to market in a matter of months as companies and countries throughout the world strive to become leaders in the field. Traditional approaches to regulation that involve new permits and rules for every technological innovation will be widely resisted because they will be seen as stifling innovation and hindering competitiveness. At the same time, industry regulations must be sufficiently stringent to protect human health and the environment.

This situation requires all stakeholders to consider new, more flexible regulatory approaches that rely on performance and transparency. These types of regulatory approaches must be developed through a collaborative process involving government, industry representatives and advocacy organizations to build confidence in the regulatory framework. One readily available model for flexibility is the "plant-wide applicable limits" approach developed under the Clean Air Act and used in EPA's Project XL program. Under this program, Intel, working with its local stakeholders and EPA, was able to design a new permit that allowed its microchip production facilities to change their product mix without new permits so long as umbrella emissions limits for entire facilities were met. With a product life cycle that can be as short as eight months, the ability to change products without having to modify a permit was essential for Intel to remain competitive.

A second model for flexibility is the cap and trade system used to regulate sulfur dioxide emissions from coal-fired power plants. Because the primary concern about sulfur dioxide emissions was that they generated acid rain over wide areas of the country, Congress established a ceiling (a cap) on sulfur dioxide emissions from coal-fired power plants at a level substantially lower than existing emissions. After allocating emissions allowances to all of the regulated facilities, Congress authorized the facilities to trade emissions allowances among each other so long as a plant held at the end of each year one allowance for each ton of sulfur it emitted. This system allowed the plants wide latitude in choosing how to control emissions, stimulated innovation and substantially reduced the cost of compliance.

The point of these two examples is not that they have specific applicability to nanotechnology. Rather, the examples demonstrate that imaginative regulatory approaches can be devised in the context of open stakeholder negotiations.

Two elements were essential to the success of the more flexible approach used in the Intel situation: enhanced monitoring and public reporting, as well as earlier and more substantial stakeholder involvement. Because flexible permits are designed to reduce delays caused by frequent government approvals, alternative accountability mechanisms must be substituted to ensure the public is adequately protected. These mechanisms include government and public access to additional information that can help track facility performance and identify problems, and more stakeholder influence at the front end of the approval process over the structure of the regulatory mechanisms [3]. Just as it has worked for the microchip industry, a more flexible approach to permitting designed with broad stakeholder involvement and relying on enhanced monitoring and public reporting may allow the nanotechnology industry to continue its rapid growth while protecting public health and the environment.

2.2 Creating and Maintaining Public Confidence

If the nanotechnology industry does not address issues of public confidence in the technology, it may suffer the same fate as that of genetically modified seed crops in the European Union: rejection of the crops as unsafe by the public and by public officials even though the scientific consensus identified little risk from the use of GMO seeds [4]. Public confidence is primarily an issue of values and political and economic power, rather than a regulatory issue. If opinion leaders view a product as antipathetic to the values they hold, products may either be banned from the market or not survive in the market, regardless of the actual risk involved. The specter of unfounded public rejection suggests that accountability tools must be identified that create public confidence in the industry.

The risk of public rejection is especially acute in situations where scientific uncertainty is significant and where interest groups are likely to stake out strongly held positions early in the development of the technology. As Professor Gregory Mandel noted in his study of responses to risks posed by biotechnology and by nuclear power production, "individuals and interest groups do not revise their technology preferences in response to scientific and empirical information in the manner that such information appears to indicate [5]." Rather, a wide range of cultural factors tend to drive and reinforce polarization. These factors include biased assimilation of new data—Mandel notes that "individual beliefs are remarkably resilient to the introduction of new data that challenges the beliefs [6];" the tendency of individuals to rapidly and automatically have a positive or negative feeling when confronted with certain ideas or concepts; cognitive dissonance avoidance which leads individuals to discount information that conflicts with their perception of risks; and group dynamics that tend to perpetuate and reinforce polarization among individuals who socialize with those holding similar views [7]. The polarization phenomenon is aggravated by the fact that moderate voices tend to be underrepresented in debates

involving technological risk because moderate voices typically do not inspire a "moderate movement."

The risk of public rejection of nanotechnology may be reduced if companies and government use the tools of environmental accountability early in the commercialization process. Accountability can be enhanced by providing open access to information about the public health and environmental issues, involving a wide range of stakeholders in discussions about the appropriate approaches to regulating nanotechnology, enhancing monitoring, providing the public with credible information about both the risks and the societal benefits of the technology, and creating a process that allows regulations to adapt to new scientific findings [8].

A systematic approach to environmental accountability requires constructive contact among the industry, government, advocacy organizations and other public stakeholders. Mandel espouses a concept he calls "dialogue and deliberation" in which representatives of all of the interest groups (including "moderates") engage in a "culture-conscious" dialogue that focuses on values, not just competing scientific claims about benefits and risks. "The goal of the dialogue would be to help different groups learn about each other and each other's views, with a goal of cultural accommodation and understanding. Once these objectives have been achieved, a substantive policy deliberation can begin, aimed at developing widely-acceptable policy solutions [9]." Both the Meridian Institute and the Environmental Law Institute have convened policy dialogues related to nanotechnology to launch the deliberation process, but a much more robust dialogue involving many more stakeholders and more approaches to assure environmental accountability will be needed as the industry continues to evolve [10]. The earlier that these dialogues are initiated and the more open they are, the more likely that the dialogues will avoid or overcome interest group polarization, discuss the real risks associated with the industry based on the best available scientific evidence, and find ways to address the risks while allowing the industry to continue to develop [11]. The result should be increased public confidence and reduced risk of unfounded rejection of new technology.

2.3 Minimizing Liability Exposure

Nanotechnologies will face the threat of legal liability under nuisance or negligence theories if their use causes harm to public health or the environment. The potential for civil liability is a key element of accountability because government resources to deal with environmental problems are shrinking at the same time as environmental threats are increasing. The civil liability system plays a critical role in tempering corporate decisions to introduce potentially risky products into the market prematurely.

Companies should be able to mitigate their liability exposure by incorporating other aspects of environmental accountability into the way they do business [12]. Liability can be mitigated by a robust regulatory regime that will encourage courts to view compliance with the regulatory scheme as establishing reasonable care on the part of the industry. The risks of civil liability can also be minimized by increased transparency. The worst-case scenario for companies is demonstrated by the fate of the asbestos industry and, more recently, by litigation related to anti-inflammatory drugs. A key factor in both liability situations is that information about the adverse impact of asbestos and the drugs was available to the manufacturer but was not disclosed to the public or regulatory authorities. Prompt disclosure of information about adverse impacts of a product does not immunize a company from legal liability. However, it can reduce the potential of legal liability in several ways.

First, the prospect of disclosure can provide the impetus for a company to modify its product, temporarily remove it from the market until the impact can be better understood or encourage clearer warnings to the public. Second, disclosure can prompt regulatory action including additional studies, product warnings or market restrictions. Third, disclosure can allow consumers to make more informed choices in the use of a product. Finally, wider stakeholder involvement early in the approval process may raise issues or problems that could be resolved before a product reaches the market avoiding potential mishaps.

The prospect of liability for harm to public health or the environment will be an important accountability tool for the nanotechnology industry. But, equally important, the industry has the opportunity to minimize that liability by employing other accountability mechanisms such as public reporting and early public involvement.

3 CONCLUSION

The nanotechnology industry is a good candidate for introducing a new approach to environmental accountability. The industry is still in a developmental stage; it presents unique environmental and public health challenges; needs an adaptive regulatory structure; is growing rapidly in a very competitive global context; and has the potential for transforming many aspects of the world economy [13]. Now is the time to develop and implement a new approach to environmental accountability for the industry.

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