104

ENVIRONMENTAL REGULATION: A BARRIER TO THE USE OF ENVIRONMENTAL TECHNOLOGY?

JOINT HEARING

BEFORE THE

SUBCOMMITTEE ON TECHNOLOGY

AND THE

SUBCOMMITTEE ON ENERGY AND ENVIRONMENT

OF THE

COMMITTEE ON SCIENCE

U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED FOURTH CONGRESS

SECOND SESSION

JUNE 20, 1996

[No. 63]

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ENVIRONMENTAL REGULATION: A BARRIER TO THE USE OF ENVIRONMENTAL TECHNOLOGY?

THURSDAY, JUNE 20, 1996

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE,
SUBCOMMITTEE ON TECHNOLOGY AND SUBCOMMITTEE ON
ENERGY AND ENVIRONMENT
Washington, DC.

The Subcommittees met at 10:10 a.m. in Room 2318 of the Rayburn House Office Building, the Honorable Constance A. Morella, Chairwoman of the Subcommittee on Technology, and the Honorable Dana Rohrabacher, Chairman of the Subcommittee on Energy and Environment, presiding.

Mrs. MORELLA. Ladies and gentleman, I think we will convene this joint hearing this morning of the Technology Subcommittee of the Science Committee and the Environment and Energy Subcommittee of the Science Committee.

Chairman Rohrabacher will be joining us soon. He has been stuck in traffic. I think preparation is being made for the Olympic Torch which will be coming through the Washington area later on today.

Today, though, at this hearing, we're going to discuss the impact of environmental policy and regulation on the development and the use of environmental technology.

The proliferation of new technology is having a tremendous impact on virtually every industry and environmental protection is no exception.

Unfortunately, U.S. environmental policy doesn't always provide a framework that maximizes the benefits of high technology for the environment or industry, or at least we will hear more about this.

The development of new technologies in environmental protection appears to be outpacing the ability of the government to effectively regulate new products and processes.

Delays in approving new environmental technologies have significant impacts on our quality of life and competitive advantage. The United States maintains the world's most stringent environmental regulations.

This regulation has given our nation's industries the incentive to lead the world in the development of environmental technologies.

However, we must be cautious that that lead is not challenged by foreign companies in countries that are more effective at employing new and better environmental technology.

The United States need not lower its environmental standards to remain competitive, but it should discontinue regulations that are no longer effective and work to embrace new technology for the benefit of the environment.

The Clinton Administration has responded to the problem of inefficient environmental regulation and the need to promote new technology by providing the Environmental Technology Initiative.

This program's goals of reforming a regulatory process to promote innovation and strengthen the ability of companies to develop and market new technologies are admirable.

However, the ETI may not be an efficient means of accomplishing this goal. ETI would require millions of dollars to be appropriated for the purpose of reviewing and reforming the EPA's regulatory framework.

Providing an effective regulatory framework is already a primary mission of the EPA and therefore this need not require new initiatives and additional funds.

It should simply require a commitment from EPA and Congress to provide effective government.

In addition, ETI provides millions of dollars for strategic investment in private companies to promote the development and application of promising environmental technologies.

This policy is a costly and unnecessary government interference in the environmental technology marketplace. The development of environmental technology is proceeding at an unprecedented rate in this country. And the marketplace would be better served by more efficient environmental policy and regulation.

The House has not provided funding for the Environmental Technology Initiative for fiscal year 1997.

Now, I look forward to discussing the EPA's views on the ETI and other issues that would affect environmental technology with Mr. Gardiner, and I'm also eager to hear the concerns and suggestions of all of our other witnesses.

So we're here to learn how we can best employ and promote environmental technologies using our government to act in partnership.

And so I would now, it gives me great pleasure to recognize, a gentleman, Mr. Roemer, who's very active on the Energy & Environment Subcommittee and on the Full Science Committee.

Oh, and Mr. Rohrabacher is here and he's the Chairman of the Subcommittee.

Mr. ROEMER. Thank you, Mrs. Morella. I appreciate the opportunity to speak to this issue for a few moments, and I ask unanimous consent to submit my formal statement for the record.

Mrs. MORELLA. Without objection, so ordered.

Mr. ROEMER. First of all, I'd like to begin by thanking and saluting both you, Mrs. Morella, and Mr. Rohrabacher from California, for holding this hearing.

This continues a long tradition in this community of bipartisanship on trying to develop effective and efficient environmental technologies to address our environmental problems.

I will submit my statements and, you know, hold the accolades and all the nice things about you and Mr. Rohrabacher. You can read about those in the record.

I do have a couple concerns, however.

We all want effective government. We all want less regulation, and less paperwork. Certainly my record in voting for reducing paperwork and voting to stop the unfunded mandates supports that contention.

But I worry that this hearing is coming after the fact that we've killed the Environmental Technology Initiative. It's almost like shooting first and asking questions later, or shooting from the lip or shooting from the hip.

We need to make sure that if this program has been helpful to us, and the General Accounting Office, with their fairly recent study, estimates that the innovative technologies are now being used at 20 percent of Superfund sites, up from six percent in 1986, and this has saved taxpayers about $21 million per site, this seems to point to some evidence that this has been a successful program, and that there can be some cooperation in new and innovative ways in developing these new, efficient technologies to address environmental programs and problems.

So I'm delighted that we're having this hearing. I am happy that we're doing this in a bipartisan way, but I'm somewhat curious as to why the Environmental Technology Initiative, if it has been successful, if the General Accounting Office has pointed out some past successes since 1986, why we would kill this.

Secondly, it would bring up the question, what do we do from here? How do we make sure that we have some partnership or some cooperation between our states and our federal government in this very, very important area?

I want to make sure that we stay consistent with our votes earlier this year on not providing unfunded mandates to our states. So I would be curious to ask the panel, if we don't have some assistance on the part of the government to provide some help, are we in fact providing an unfunded mandate to the states to do this on their own, or do states have the resources, do states have some of the money to do this in cooperation with the federal government whether it be a Superfund site or another site.

So I will stop there, because I am very curious to hear from our expert panel today, and I appreciate their time and their counsel, and again appreciate Mrs. Morella and Mr. Rohrabacher's attention and concern on this matter.

[The prepared statement of Mr. Roemer follows:]

OPENING STATEMENT BY HON. TIM ROEMER, RANKING DEMOCRATIC MEMBER, SUBCOMMITTEE ON ENERGY AND ENVIRONMENT

HEARING ON "REGULATORY BARRIERS TO INNOVATIVE ENVIRONMENTAL TECHNOLOGY"

JUNE 20, 1996

Let me begin by commending the chairs of both Subcommittees, Mr. Rohrabacher and Mrs. Morella, for holding today's hearing. It continues a long and bipartisan history by this Committee to stimulate the development and use of environmental technologies to help solve our environmental problems.

Back in 1986, hearings by this Committee led to the establishment of the Superfund Innovative Technology Demonstration program in the Superfund Amendments and Reform Act. By permitting cost-shared demonstrations of innovative hazardous waste cleanup technologies on Superfund sites, the program has permitted developers to take their products to market with independently verified results tested in the real world. The results are encouraging. GAO estimates that innovative technologies are now being used at 20 percent of Superfund sites, up from 6 percent

in 1986. (EPA estimates even higher market penetration of innovative environmental technologies.) This has not only saved the taxpayers money—an estimated savings of $21 million per site—but it has been good for business. Superfund technology demonstration participants have been selected for over 500 cleanup jobs in the U.S.

In the 103d Congress, the House passed H.R. 3870, the Environmental Technologies Act, which also recognized the market barriers faced by innovative environmental technologies. I know that the distinguished gentlelady from Maryland was an initial cosponsor of that bill and enthusiastically supported it on the Floor. Unfortunately, work on that bill was not completed before the end of the session.

Today's hearing focuses on a limited, but important, part of the problem facing innovative environmental technologies. Regulations can inadverently create disincentives for using cleaner, faster, and cheaper environmental technologies. Today, I hope we will get a chance to hear about a number of interesting EPA experiments in regulatory flexibility that are intended to encourage innovative environmental technologies and move to a more common-sense approach to environmental protection.

At the same time, I have to express some frustration that we once again seem to be in "shoot first, ask questions later" mode. Several weeks ago, this Committee zeroed out EPA's Environmental Technology Initiative, the sole purpose of which was to remove barriers to environmental technologies. The ETI program is also zeroed out in the VA-HUD appropriations bill that we will be vohug on today. Now that the program looks well on the way to the graveyard, we are holding our first hearing on barriers to environmental technology. This seems like a curious way to do business.

Nevertheless, a late hearing is better than none, and I welcome the opportunity to hear the testimony on this important issue.

Mrs. MORELLA. Thank you, Mr. Roemer. I'm sure that we're going to have all of those questions answered.

I would now like to recognize and turn the chairmanship over to Mr. Dana Rohrabacher, who is the Chairman of the Subcommittee on Energy and the Environment.

I'm going to go to a markup, so you take over and I'll be right back.

Mr. ROHRABACHER. (presiding). Finally, the gavel in my hands. [Laughter.]

Mr. ROHRABACHER. That's what Mr. Roemer's been thinking, and maybe it will be some day. We'll see.

Well, Madam Chairwoman, I want to thank you, as you leave, for calling this hearing and inviting the Energy and the Environmental Subcommittee to participate.

I know that in the Chairwoman's district in Maryland and in my district in California, we are both home to numerous companies that are on the cutting edge of technological development.

A number of these companies have developed or are working on new technologies that produce environmentally sound products, or can help with environmental cleanup.

Later this summer, on August 8th, I will be hosting a field briefing in Huntington Beach where a variety of new environmental technologies developed by the private sector will be demonstrated.

And I hope that those of you who are with us today will be able to join us at that hearing.

It is remarkable that many of these firms, the environmental firms in particular, continue to thrive, despite the barriers that we will hear about today. This is surely a tribute to America's unquenchable entrepreneurial spirit.

And to its credit, the EPA, in its testimony today, recognizes that the system is broke, and if not totally broke, it at least needs fixing and needs repair, and we need to make it better. Whether it be the

Tax Code, or laws that basically favor the use of conventional technology or technology that we currently have versus newer technologies, or recent changes in the patent law that threaten small business, which is a subject area that I'm very interested in.

Companies are constantly having to leap over hurdles that the government has placed in front of them, and unfortunately government's answers to problems is often to create yet another government program which becomes yet another hurdle for someone else.

As Chairwoman Morella points out, in this case, it's the Environmental Technology Initiative or ETI, and that I'm sure we will hear is a disagreement, from what I've heard from Mr. Roemer, that we will hear that as a disagreement between myself, Mr. Roemer and perhaps Mrs. Morella when she returns.

It started out, the ETI started out as one of these grant programs where some, and basically I'll have to say some bureaucrat, decides if a company will be given a government check to do something that the bureaucrat likes, while another company gets turned down. And that's what we've got.

So basically, this has been touted as the answer to regulatory barriers that the government has imposed, but I don't see government giving government grants. It's better for us to focus on those barriers themselves.

It's not necessary to spend $100 million of the taxpayers' money to figure out what needs to be done, and I would say that the Congress is ready and willing to do it for free, and there are many members of Congress who are willing to put the time in to find the regulatory barriers, rather than creating a subsidy relationship.

I believe we could eliminate the barriers to development of environmental technologies on a bipartisan basis, as Mr. Roemer suggested. The Administration, however, would have to lower its rhetoric and not automatically attack those in Congress who desire to streamline regulations.

Every time we turn around, trying to, in a matter of good faith and good will, eliminate what appears to be a barrier to development of new environmental technologies, or try to do things in a more efficient way, we find ourselves being attacked basically as enemies of the environment, because we have lessened some kind of government control to try to encourage the entrepreneurs to get involved.

Our private sector witnesses today are in the forefront of technological development. I look forward to hearing their views and the solutions they have to offer.

And one last note on the patent issue. I happen to believe that one of the things that has made the United States the leader in technological development over these last 100 years and actually historically our country has been in the forefront of the development of technology, has been the fact that we have had the strongest patent system in the world.

And I believe that if we end up basically disclosing all of our technological developments before patents had been issued, that people in the private sector are going to have less of an incentive to develop new technologies, whether they're environmental technologies or whatever kind of technologies.

And we have coming before the Congress soon, a bill that will do just that, and we'll be talking to the witnesses about that situation.

So thank you very much, and I guess we will proceed with Dr. Gardiner.

Oh, Mr. Baker has an opening statement, and will first turn to Mr. Baker.

Mr. BAKER. Thank you very much, Congressman and Chairman Rohrabacher. I'll be very brief.

This hearing is essential to breaking the logjam on developing a more efficient way of getting new technologies into use in areas, such as environmental monitoring.

Environmental monitoring is of particular interest to me. With the Lawrence Livermore Lab in my district, I often hear about new technologies being developed as the fruits of our Cold War investment and defense. Also, many of our bases, airports and other public areas are highly contaminated because of use before the thirties, forties, fifties, and so on, when we just dumped the oil and the gasoline out in the backyard.

Livermore lab is working on microbes that go down and eat the pollutants right on site. Many of these developments have a hard time getting licensed and approved because they've never been done before. We have to have more flexibility.

Anyone from California knows that such a legacy of involvement in defense applications of science has spawned thousands of high tech firms throughout our state, which produced for highly specialized technical niche markets such as environmental monitoring.

A PG&E economist, Dana, told me this about two weeks ago, that the slack and downsizing in corporate America was made up by firms of 75 employees or less. These are these ideas in high tech land that goes out and starts in a garage the way Hewlett Packard and many of those firms started many years ago, in a garage, and grow to be 75 employees or less. They're taking up the slack.

So the idea that we're going to create a nation of burger flippers has long since been discredited and we are now creating a high tech environment.

But the ideas are ahead of our ability to license those ideas and it's extremely important.

Also important in our regulation plans is the fact that Hewlett Packard, now the granddaddy of all of these firms, the big firm, 75 percent of their sales are from products that weren't around two years ago.

So it's important that our bureaucracy, our regulation and our approach to new ideas is sped up.

Technology's quickly out pacing Congress' ability to understand it. And our slow government agencies' ability to put it to use.

We have to think of a better way to expedite new technologies into the marketplace.

Contrary to what many enviro-bureaucrats will tell you, new technologies will make our environment cleaner, not leave us open to higher levels of contamination.

I'm currently investigating legislation to break this logjam by moving the EPA from its current environmental monitoring methods approval process to one based on performance standards for new technology.

Throughout this process, what I've understood to be a bipartisan goal, as become more a lesson in bureaucratic entrenchment. Change, it seems, is very, very hard to accept.

True, the current regime is not acceptable to individuals in the analytical instrument industry, but I've been told also that some of the alternatives being discussed, such as cataloguing environmental contamination are actually worse than the present cure.

Any approach to speeding new technologies into use must not serve to indefinitely extend the life of more government bureaucracy, but must open the way for more private sector involvement for the folks that understand this technology and will help us put it to the use.

I really look forward to the testimony of our witnesses, especially Mr. Gardiner of the EPA and Mr. Urh with the Analytical Instrument industry.

You two are key. It is important for us to have agreement between the private sector and EPA. And, Mr. Gardiner, I'm very, very encouraged by the statements of EPA recently after forcing a firm to spend $25 million in cleaning up the wrong area, that they will indeed begin listening to industry, help them tell where the pollutants are and how to cure them.

This partnership is really essential if we are actually interested in cleaning up America.

Thank you, Mr. Rohrabacher.

Mr. ROHRABACHER. You always have to watch out when Mr. Baker pays you a compliment.

[Laughter.]

Was that a compliment? I'm sure it was.

Mr. BAKER. You're doing a swell job, Mr. Chairman.

[Laughter.]

Mr. ROHRABACHER. Thank you, Mr. Baker.

Well, I think we'll proceed now, and we have as our witnesses today, Mr. David Gardiner who's the Assistant Administrator for Policy, Planning and Evaluation of the Environmental Protection Agency.

Ms. Jan Power, President of Power and Associates Corporation.

Mr. John Urh, Sales and Marketing Manager of CETAC Technologies, Incorporated.

And Peter Carroll, Vice President of Government Affairs for Solar Turbines, Incorporated.

And Mr. Gardiner, if you'd like to—just as long as you'd like to make your testimony, but if you'd like to summarize, we would appreciate it as well.

STATEMENT OF DAVID M. GARDINER, ASSISTANT ADMINISTRATOR FOR POLICY, PLANNING, AND EVALUATION, U.S. ENVIRONMENTAL PROTECTION AGENCY; ACCOMPANIED BY WALTER W. KOVALICK, JR., DIRECTOR, TECHNOLOGY INNOVATION OFFICE, OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. GARDINER. Sure.

Thank you, Mr. Chairman.

I appreciate the opportunity to be here. I think it's great that you're having this hearing, and we're looking forward to talking

about what we're doing at EPA to promote environmental technologies, both through the Environmental Technology Initiative as well as other changes that we've particularly been making in terms of reinventing EPA's environmental regulations.

New technologies have been critical to the progress that we've made in our nation over the past 25 years and they hold the key to our future success as well. In fact, we can think of no area that holds more opportunities for improving the future quality of life here in this country, as well as around the world, both environmental and economic, then development and use of more effective and less expensive environmental technologies.

Over the past 25 years, the United States has earned a well-deserved reputation as the most environmentally protective industrialized nation on earth.

While our economy continues to grow and generate new jobs, we've put in place an environmental system that's led to substantial improvements in protecting our health and our air and our water and land.

An important factor in that success has been our ability to conceptualize, build and introduce into the marketplace, new ways of controlling and preventing pollution.

Think of the catalytic converters that are now standard equipment on all cars built in the United States today. Twenty-five years ago, people debated whether such a device would work effectively and whether its cost was within reach of the car buying public.

Today, we know catalysts make both economic and environmental sense. It may be possible to imagine a world where catalysts don't exist, but it probably would be very difficult to breathe well there.

The development and use of automobile catalysts, like most environmental technologies, was driven by our system of environmental protection.

In fact, many of the environmental standards that are currently in place do tend to "lock in" the use of specific technologies that were well-understood when the standards were promulgated years ago.

The use of such technologies, the best available at the time, have led to substantial human health and environmental benefits for all Americans.

The benefits of our investments in environmental technologies make economic sense as well. Because the United States was the first country to pass comprehensive environmental legislation, domestic companies got an early start on developing the environmental products and services that today are in demand all over the world.

More than a million Americans are employed in this field today. And as we look to the future, we know that by the year 2000, the global demand for environmental technologies may be as large as half a trillion dollars.

Because today's environmental protection system inadvertently puts barriers in the way of new technology development, EPA is working hard to change that system. We are working hard to reinvent EPA to reduce cost, time, and paperwork for the regulated

community without sacrificing one ounce of environmental and public health protection.

And we are convinced that one of the best ways we can become cleaner, cheaper and smarter is by encouraging and supporting the development of a new generation of environmental technologies.

Technological improvements are critical to the achievement of several related goals. First, they will help us further improve human health and environmental conditions here at home in the United States.

Despite past progress, we still face unacceptably high risks related to air and water pollution. More than 50 million Americans still live in areas which do not meet the health-based air quality standards of the Clean Air Act.

Forty percent of our nation's rivers, streams, lakes and estuaries, are still too polluted for one or more beneficial uses.

Moreover, our ability to manage emerging environmental risks, like cryptosporidium in drinking water depends in large part on our ability to develop new monitoring and control technologies.

Second, we know that new technologies will help to reduce the costs of environmental protection. Since the passage of the Clean Air Act Amendments of 1990, for example, the capital and operating costs of power plant scrubbers have declined by almost 50 percent.

We need to make the same kind of progress in other areas.

Third, an environmental protection system that fosters the development of new technologies to solve domestic environmental problems will give a substantial boost to domestic companies competing for business in the global environmental marketplace.

If domestic companies continue to develop innovative technologies here at home, they'll be much tougher competitors overseas.

Fostering technological innovation is one of our major goals at EPA. And we've learned that one of the quickest ways to achieve that goal is through a "performance-based" system that allows the regulated community the flexibility to define the best ways of hitting environmental targets.

Through our Project XL, for example, we are inviting businesses to carry out facility specific projects that achieve better environmental results at less cost.

In essence, these businesses promise greater environmental protection in exchange for regulatory flexibility from the Environmental Protection Agency.

I believe that this new flexibility, a flexibility backed up with regulatory incentives, will foster a burst of technological innovation in American companies, while also delivering a cleaner environment for the American public.

We are already seeing the fruits of flexibility in other EPA programs. For example, under the Clean Air Act of 1990, coal-fired power plants can choose from a wide variety of control options to reduce their emissions which cause acid rain.

One of those options is the purchase of emission credits earned by other power plants who may have devised a cheaper way to limit sulfur dioxide omissions.

This market flexibility has already spawned a wide variety of innovations, including major advances in scrubber technology, fuel cleaning, fuel blending and environmental dispatching.

At EPA, we are expanding this market-based, innovation nurturing approach and applying it to water pollutants and other kinds of air pollutants.

In the Superfund program, EPA is encouraging the use of innovative technologies at cleanup sites by sharing the economic risks with Potentially Responsible Parties (PRPs).

For selected technologies, EPA will reimburse those Potentially Responsible Parties for up to 50 percent of their innovative technology costs if the new technology fails and subsequent remedial action is required.

EPA is also helping local governments in cooperation with the Bureau of Reclamation, the State of Arizona, and the City of Phoenix. We are overcoming regulatory barriers to the use of constructed wetlands as an alternative to traditional waste water treatment and water reuse technology.

The City of Phoenix claims that this project will save the ratepayers between $300 to $500 million over the long run, while improving water quality and enhancing wildlife habitat in the Salt River watershed.

These projects, and dozens of others underway with EPA support, and I would include with funding from the Environmental Technology Initiative, have a value beyond the money that will be saved at specific test sites.

The technologies developed may ultimately be used at hundreds of other sites, both in the United States and overseas, thus protecting human health, strengthening the economy, and creating jobs for American workers.

The investment we're making today in technological innovation will pay human health, environmental, and economic dividends well into the next century.

I think we are happy to be here today and looking forward to discussing with you, both those efforts to change our policies to encourage innovation in the environmental technology field, as well as the successes which we've achieved under the Environmental Technology Initiative.

Thank you very much.

[The prepared statement of Mr. Gardiner follows:]

TESTIMONY OF DAVID GARDINER
ASSISTANT ADMINISTRATOR FOR POLICY, PLANNING & EVALUATION
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
SUBCOMMITTEE ON TECHNOLOGY
AND THE
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
OF THE
COMMITTEE ON SCIENCE
HOUSE OF REPRESENTATIVES

June 20, 1996

Good morning. I am pleased to be here today to discuss our shared interest in facilitating the use of high technology to improve the environment. The U.S. Environmental Protection Agency (EPA) agrees with the Subcommittee on Technology and the Subcommittee on Energy and Environment that the development and deployment of cleaner, safer and cheaper environmental technologies in the U.S. is lagging, and that we are not able to maximize the benefits of high technology for the environment or industry. As the agency primarily responsible for administering the U.S. environmental policy framework, EPA is in a unique position to lead other federal, state and local agencies in an effort to reduce regulatory and policy barriers to, and increase incentives for, technology innovation, while ensuring that environmental protection is not compromised. I am pleased to report today on the many significant activities that EPA is undertaking in this regard.

The Importance of Innovative Technologies

Perhaps nothing is more essential to achieving our nation's environmental goals than the ability to successfully develop and deploy new technologies for environmental protection. The existing stock of environmental technologies is simply not adequate to solve many of today's environmental problems, let alone the daunting challenges that lie ahead. Both here and abroad, better and more economical technologies are needed to protect public health and the environment at an affordable cost.

Developing improved environmental technologies is not only good for the environment, it's also good for business. The U.S. environmental industry accounts for annual revenues of $134 billion and has created more than a million jobs. With global demand for environmental technologies projected to reach $300 - $500 billion annually by the year 2000, the successful introduction of new and better products and services will help this industry successfully compete in expanding international markets. America's principal trade partners, Germany and Japan, have already positioned themselves to capture a leading share of the global market. The U.S. must either strengthen its own presence in the market, or be left behind.

Market Impediments to Innovative Technologies

A number of impediments -- both internal and external to EPA -- limit private sector investment in innovative environmental technologies. These impediments include:

- Statutes, regulations, policies, and procedures at the federal, state and local levels that favor the use of conventional, often less efficient or cost-effective technologies;
- Reluctance on the part of private industry and the financial community to fund the development of new technologies because of changes in the tax code and uncertainties as to whether innovative methods will be approved for use by regulatory agencies;
- Inability on the part of technology users, financiers, consulting engineers, and regulators to obtain credible, independently verified data on the performance and cost of promising new technologies; and
- Lack of established information networks that provide users with awareness of (and easy access to) better, cleaner, safer and lower-cost technologies.

EPA is working to overcome all of these impediments so as to encourage greater private sector development and use of innovative technologies. But of all the factors that inhibit technology innovation, perhaps none is more significant than the prescriptive nature of the environmental policy framework -- including regulatory, permitting and enforcement programs -- at the federal, state and local levels. Despite the traditional advantages of prescriptive regulations (especially to small and medium sized businesses that seek regulatory certainty and a sure path to compliance), if EPA is to succeed in its mission to protect public health and the environment, we must work within our own programs, and with our state and local partners, to build additional flexibility into the environmental policy framework.

EPA's Policy Framework Drives the Market

Unlike other consumer markets, the demand for environmental goods and services in the U.S. is largely driven by the environmental policy framework that EPA administers, in partnership with the states. American businesses spend over $130 billion a year to comply with environmental mandates. But EPA's rules, guidelines and administrative procedures sometimes hinder technology innovation by making it difficult or undesirable to use new monitoring, assessment, pollution prevention, remediation, or control techniques.

Barriers to Innovation in the Policy Framework

Barriers to technology innovation in the environmental policy framework can take many forms (see Appendix I). For example, many environmental standards that are currently in place tend to "lock in" the use of existing technologies because they are based on reference technologies that were already well-demonstrated when the standards were promulgated. Even where companies are legally permitted to use alternative methods to meet a standard, they are usually unwilling to risk non-compliance by implementing a relatively unknown or unproven technology. Enforcement personnel do not normally grant exceptions for businesses that make bona fide attempts to comply using an innovative approach but need extra time or fall short of the regulatory mark. Since companies are given no reward for trying a new approach and no protection against failure, conventional technologies tend to be used over and over again, freezing out newer and more effective options.

Another barrier is the unpredictable nature of the statutory and regulatory development process. It is not unusual for the reauthorization of an environmental statute or the promulgation of an environmental standard to take many years. Only at the end of that long process is the required performance level established. However, once the law or standard has been put in place, compliance may be required within a relatively short period of time. Since the development cycle for new technologies can be ten years or longer, there may not be enough lead time for the efforts of technology developers to bear fruit. Even when developers begin their efforts early, uncertainty in the statutory or regulatory development process may make it difficult to obtain financing, since a proposed technology is likely to either over-shoot or fall short of the eventual (unknown) regulatory requirement.

There is no substitute for strong environmental regulations and enforcement in creating the underlying demand for environmental products and services. But environmental programs can be implemented in ways that either help or hinder the development and use of innovative technologies. While some of the barriers inhibiting innovation are rooted in our environmental statutes, there is much that EPA can do to make its regulatory programs more "friendly" towards innovative technologies.

25 Years of Progress and Lessons Learned

In the quarter century that has elapsed since the first Earth Day, the American people have enjoyed dramatic improvements in public health and the natural environment. As we achieved these successes, we learned a great deal about the

advantages and disadvantages of "command-and-control" regulation. Command-and-control approaches have produced some important successes and they have helped us to get where we are today. Some companies still prefer the straight-forward, cookbook-like nature of prescriptive regulations. But prescriptive regulations can sometimes be inflexible, resulting in costly compliance actions that defy common sense. They can also discourage technological innovation. We now know that we must expand the available policy tools to include more flexible approaches that reward innovation and achieve greater levels of environmental protection at lower cost.

We have learned that setting "performance-based" standards and allowing the regulated community to find the best ways to meet them can bring about cheaper, quicker and better results than mandating design standards or specific technologies. Through performance-based approaches, we can promote both lower-cost environmental protection ***and*** innovation in environmental technology. We have also learned that performance-based standards combined with economic incentives can provide a powerful engine for innovation.

For example, Congress in 1990 enacted a market-based acid rain control program with a tradeable credits provision to further reduce sulfur dioxide (SO_2) emissions by 50 percent. Under this program, coal-fired power-plants can choose from a wide variety of control options in meeting their emission reduction requirements, including demand-side management programs, switching to lower-sulfur fuel, buying emissions credits and installing scrubbers. By rewarding superior performance with tradeable credits, the program has already spawned a wide variety of innovations in

pollution control and prevention, including major advances in scrubber technology, fuel cleaning, fuel blending, and environmental dispatching. U.S. vendors, for example, are now guaranteeing retrofit scrubbers at 98 percent control efficiency, whereas the ability to achieve even 90 percent control at existing units was in doubt just a few years ago. Moreover, the capital and operating costs of these improved scrubbers have dropped by almost 50 percent. The net effect is a more competitive pollution control industry and a much cheaper control program than anyone had previously thought possible.

Reinventing Environmental Regulation

Under the leadership of President Clinton, Vice President Gore and Administrator Browner, EPA is drawing on the lessons of the past 25 years to change the way we do business. In terms of environmental technology, this means developing regulations, policies and procedures that promote innovation instead of stifling it. It means fostering a partnership between the private and public sector that taps each sector's respective strengths. Ultimately, it is the private sector's job to produce innovation. But it is the government's job to create a regulatory framework within which technology innovation is rewarded, not penalized. The key to a successful partnership between government and industry is greater reliance on flexible, performance-based regulations that harness the ingenuity of the private sector.

As Vice President Gore put it, "the next generation of environmental policy must stress flexibility with increasing accountability and environmental quality. Without flexibility, we will not innovate. Without accountability, we will not have the trust to work

together. And without a commitment to increasing environmental quality, we will not achieve a sustainable future."

Moreover, the report of the President's Council on Sustainable Development shows that the Administration's vision of the future of environmental protection is shared by a broad set of stakeholders. This diverse group of industry, government, academic and environmental community representatives recently came together and proposed a dual-track approach to improving the regulatory system -- a first track, to increase the cost-effectiveness of the existing system; and a second track to develop an alternative environmental management system that would give members of the regulated community the flexibility to design their own environmental management strategies in return for a commitment on their part to exceed the traditional standards.

EPA's Two Track Approach

EPA's strategy to reinvent environmental protection runs parallel to the approach recommended by the PCSD report. The ***first*** track is a set of high priority actions targeted to fixing problems with ***existing*** regulatory programs. These actions demonstrate our commitment to providing flexibility, sparking innovation, and requiring accountability; to cutting red tape; to encouraging collaboration; and to focusing upon achieving environmental results in local communities, rather than adherence to bureaucratic procedures in Washington.

The ***second*** track is a set of high priority actions designed to develop innovative ***alternatives*** to the current regulatory system. We will enter into partnerships with

businesses, environmentalists, states and communities to test alternative management strategies for single facilities, industrial sectors, and geographic areas. The knowledge gained from such bold experimentation will lay the groundwork for developing a new environmental management system for the 21st century.

This ***dual*** strategy is a comprehensive approach to continually improving our environmental management system -- aimed at our twin goals of enhanced environmental protection and economic growth.

Improving the Existing Regulatory System

Under the first track of our reinvention strategy, EPA is making a host of changes to existing regulatory programs in order to remove barriers to innovation and reward private market development of new technologies. These changes include broad-based reforms that provide thousands of businesses, communities or other regulated entities with flexible, performance-based options for compliance, as well as more targeted reforms that address discrete problems faced by specific technologies or industries. A number of EPA's innovation-promoting reinvention efforts are outlined in Appendix II. I'd like to take a few moments here to describe some of these efforts.

Expanding Use of Trading Programs: Based on our successful experiences with the market-based acid rain control program and its provisions for trading sulfur dioxide credits, as well as our previous experiences with trading programs, EPA is fostering the development of a number of new trading programs for air, water and waste management. EPA's Air Office is preparing to release its Open Market Trading

guidance for ozone precursors and recently announced a new Clean Air Power Initiative that will look into the possibility of emissions trading for nitrogen oxides, mercury, and possibly even carbon dioxide. EPA's Water Office recently issued a policy to encourage effluent trading for water quality management. Such programs are beginning to spring up in watersheds around the country. And under EPA's Environmental Technology Initiative, the Chicago Board of Trade (CBOT) is establishing an active market in recycled commodities.

Superfund Risk Sharing for Innovative Technologies: EPA's Superfund Program encourages the use of innovative technologies in Records of Decision (RODs) -- the legal instruments that specify the remedy for a site. EPA has also introduced a new incentive to encourage Potentially Responsible Parties (PRPs) to develop improved methods for cleaning up Superfund sites by agreeing to share the risks of using innovative remediation technologies. For selected technologies, EPA will agree to reimburse PRPs for up to 50 percent of the cost of the innovative remedy, in the event that it fails and subsequent remedial action is required.

Extended NOx Compliance Deadlines: EPA's Office of Air and Radiation has agreed to extend compliance deadlines for sources of nitrogen oxide (NOx), if sources are willing to install new technology that will achieve superior results. Sources of NOx pose serious threats to both human health and the nation's terrestrial and aquatic ecosystems. Conventional control technologies are complex, costly and not as efficient as they could be to control this air pollution problem. This regulatory fix will open the

door to innovative technologies while increasing environmental protection and economic benefits.

Reinvention For Innovative Technologies (ReFIT): Under the Environmental Technology Initiative, EPA has established the Reinvention For Innovative Technologies (ReFIT) Program to strengthen incentives for the development and use of promising new technologies. ReFIT is a "change agent" working to improve the environmental policy framework by supporting more than 40 action-oriented projects, demonstration programs, and policy initiatives throughout the United States. These projects are helping federal, state and local efforts to reinvent environmental management by injecting more flexibility into government policies, programs, and procedures, while ensuring improved environmental results. ReFIT is improving the existing regulatory system by moving from "command-and-control" approaches to performance-based systems that reward innovation. The CBOT Partnership to Trade Recyclable Commodities, which I have already mentioned, is one of ReFIT's many important programs. In order to give you a better flavor of what ReFIT is accomplishing, I'd like to briefly describe a few more of its programs.

Innovative Technology and Pollution Prevention in CAA Operating Permits: Under the ReFIT program, EPA has begun a new federal/state/industry partnership to allow companies to meet air quality standards with flexible, performance-based CAA Title V operating permits that encourage technology innovation and pollution prevention. This partnership builds on a successful joint effort by Intel Corporation, the State of Oregon and EPA, which resulted in the first flexible Title V permit in the nation

for Intel's Aloha facility . But different facilities possess different characteristics and each state's regulatory framework is somewhat unique. Therefore, EPA has established this new partnership, involving 5 different industries in 5 separate states, with the goal of developing additional models of permit flexibility. These new models of flexibility will be integrated into EPA's Title V regulations and operating guidance, thereby improving Title V implementation nationwide. Over the next few years, tens of thousands of facilities throughout the country will be required to obtain Title V permits. Many could benefit from the new models of flexibility that will be developed by this program.

Increasing Inter-State Cooperation in Permitting: Under the ReFIT program, EPA, the National Governors Association (NGA) and six states are working together to overcome interstate barriers to technology innovation. California, Illinois, New Jersey, Massachusetts, Pennsylvania and New York signed a Memorandum of Understanding on June 4, 1996 committing to conduct a pilot program to evaluate 12 technologies, to develop a standard format for information exchange, and to establish a coordinated, streamlined procedure for reciprocal permitting of new technologies. NGA will analyze the results of the 6-state process, sponsor a workshop to obtain broad stakeholder input, and then write a report on how this type of process could be implemented at the national level. The report will be distributed nationally by NGA and EPA. The ultimate goal of this partnership is to enable innovative technology developers who have gone through the time and effort of getting a technology approved for use in one state, to later get the same technology readily accepted in another.

Overcoming Barriers to Constructed Wetlands: Tres Rios Project in Phoenix: ReFIT is helping the Bureau of Reclamation, the Arizona Department of Water Quality and the City of Phoenix overcome federal and state regulatory barriers to the use of constructed wetlands as an alternative to traditional wastewater treatment and water reuse technology. This collaborative effort is helping to address NPDES issues, endangered species issues and other permitting and regulatory requirements confronting the Tres Rios project as it is scaled up to full operation. The City of Phoenix claims this project has the potential to eventually save city ratepayers $300-500 million, improve water quality and enhance wildlife habitat in the Salt River watershed. The Tres Rios pilot permit will serve as a model for more than 20 other communities around the country which are also interested in using constructed wetlands to solve their water quality problems.

Creating Building Blocks for a New System

Under the second track of EPA's reinvention strategy, we are laying the building blocks of a new system of environmental protection. As we streamline the workings of the current system, we are also testing new tools that could provide similar, or even broader flexibility to the regulated community. The cornerstone of this new system of environmental protection is EPA's Project XL (Excellence and Leadership).

Project XL provides an unprecedented opportunity for selected entities -- industrial plants, industrial sectors, communities, and federal agencies -- to pilot alternative management strategies that are both less constrained by the detailed

prescriptions of regulations and more effective in fulfilling environmental goals that exceed standards. This program has drawn wide praise even in its early stages because it offers both the ***flexibility*** that businesses and other regulated entities seek, as well as the bold environmental protection ***results*** that the American public expects. Project XL offers a win-win opportunity for industry, federal and state regulatory agencies, and society as a whole. The result will be a cleaner environment through a more efficient, less-costly regulatory system.

EPA's Commitment is Strong

Through these and other efforts, EPA is committed to developing an environmental policy framework which encourages innovation -- one which will allow the private sector to maintain its status as a world leader in developing and using environmental protection technologies. By eliminating policy and regulatory barriers that inhibit new technologies from getting to market, EPA's reinvention programs will give the private sector incentives to invest in the technologies that they determine are winners. We look forward to working with the Subcommittee on Technology and the Subcommittee on Energy and Environment to advance our mutual goals in this important area.

Appendix 1

REGULATORY BARRIERS TO TECHNOLOGY INNOVATION

A. INFLEXIBLE AND OVERLY PRESCRIPTIVE REGULATIONS

Technological "Lock-In"

With few exceptions, the environmental laws in place today are characterized by reliance on technology-based standards. EPA or state regulatory agencies must identify the best technologies currently available in the marketplace (with or without consideration of cost), and promulgate standards for each industry based on these technologies. Even so-called "performance standards" are usually developed around a particular technology and may have the practical effect of mandating that technology's use. Unless and until the standard for an industry is changed, the same technology will be used over and over again, thereby freezing out newer and more effective options. In theory, most standards are supposed to be updated on a periodic basis (e.g., every five years). In practice, however, such standards are rarely changed.

Rigid Standards Mandating Narrow Bands of Performance

For most environmental regulations, the required band of performance is so narrow that most potential technologies perform either too poorly or too well. For example, a new technology that performs slightly below required levels in its first application must be rejected, even though it could be refined over time to provide superior performance at a small fraction of the cost. Meanwhile, a new technology that initially performs far better than an existing one is likely to be more expensive to develop and use (at least in its first applications). Without a regulatory mechanism that rewards superior performance, this improved technology cannot be successfully marketed.

Single Media/Single Emission Point Focus

Most regulatory programs reflect a very narrow approach to environmental protection, focusing exclusively on one pollutant or medium (e.g., air, waste or water), and requiring specified reductions from each emission point or industrial process within a plant. Such programs discourage investments in technologies that can efficiently prevent or reduce a range of pollutants across an entire facility.

B. BURDENSOME AND UNPREDICTABLE REGULATORY PROCESSES

Lengthy Permit Reviews

Analyzing new technologies can take considerable time and effort on the part of a permit authority. It can also require the attention of experienced personnel. A seasoned permit writer may be able to review five or ten permits involving conventional technology in the time it would take to review a single innovative technology. With expanding permit workloads and limited agency resources, the review of innovative technologies tends to get pushed to the back burner.

Market Segmentation

Most federal environmental programs establish uniform national environmental standards but leave a great deal of discretion to individual states in deciding how to best implement these requirements. Many states, in turn, delegate decision making to local environmental authorities. The result is that innovators must develop and sell their technologies in a large number of submarkets with differing performance requirements, rather than servicing a unified national market. Segmented markets may inhibit innovation because they increase the paperwork, time and cost involved in certifying a new technology. Moreover, such markets may not be large enough to warrant investment in new technologies that have limited applicability.

Inadequate Lead Time for Innovation

The development of an environmental law or regulation may take many years. Only at the end of that long process is the required performance level known. However, once enacted or promulgated, requirements typically become enforceable within a short period of time. Since the development cycle for new technologies is usually much longer -- often ten years or more -- there may not be enough lead time for the efforts of technology developers to bear fruit. Even when developers begin their efforts well before a new standard is promulgated, lack of predictability in the legislative or rulemaking process makes it difficult to obtain financing.

C. RISK AVERSION AND INTOLERANCE OF FAILURE

High Burden of Proof

Environmental programs typically impose a high burden of proof on new technologies. Regulators and permit writers prefer the tried-and-true since imposition of a technology that is not well demonstrated may result in industry litigation, and approval of a firm's compliance plan which relies on unproven technology may result in failure to protect public health and the environment.

Lack of Soft-Landings

Even where regulations and permit writers do not prevent the use of an innovative technology, the risk of noncompliance may be too great for a potential innovator to bear. Any new technology, even the most promising, may experience difficulties the first time around. But rigid statutory requirements and unforgiving enforcement practices provide little accommodation for failed efforts to employ new technologies. Indeed, firms may face double jeopardy -- penalties for noncompliance coupled with the cost of replacing the failed technology with conventional controls -- in the event that their innovation falls short of the regulatory mark.

D. OTHER BARRIERS TO INNOVATION

Information Deficiencies

Innovators of new environmental technologies often lack the information they need to move their technology from the drawing board to the global marketplace. Many regulated entities, especially small businesses, find it difficult to determine exactly what clean up measures are required of them under the law. Meanwhile, the financial community, regulators and the public often lack the ability to make informed decisions about innovative technologies due to a lack of independently developed or verified data about availability, performance and cost. These information deficiencies are even more pronounced abroad. This limits the worldwide availability of U.S. environmental technologies and hampers global environmental improvement. The informational deficiencies in the international marketplace also restrict opportunities for U.S. customers and the domestic environment to benefit from the use of new technologies developed elsewhere in the world.

Lax Requirements and Inconsistent Enforcement

There is no substitute for strong environmental regulations and enforcement in creating the underlying demand for environmental products and services. Innovation on the part of domestic manufacturers may suffer where the regulatory program in the U.S. lags behind that of other industrial nations. Regulated firms may delay purchases of innovative as well as conventional technology in an uncertain climate of enforcement. Lax regulations or weak enforcement may also discourage potential investors from lending financial support for the development of new technologies.

Culture of Conflict

After years of adversarial relations, regulators are suspicious of industry's motives in advancing new technologies -- they fear that environmental protection will be sacrificed for the sake of profits. Industry, in turn, does not trust regulators to review their new technologies quickly, or to treat them fairly in the enforcement process if good faith-efforts to develop a new technology fail. Environmentalists are suspicious of

industry's motives in advancing new technologies and they are dubious of regulators' ability to withstand industry pressure to water down tough requirements through the approval of cheaper but untested control techniques. In the past, there have been few efforts by government, industry and the environmental community to work together collaboratively in order to meet our common technology-related goals.

Appendix 2

EXAMPLES OF EPA EFFORTS TO STRENGTHEN INCENTIVES FOR INNOVATIVE TECHNOLOGIES

Market-Based Acid Rain Control Program

The Acid Rain Control Program was enacted in 1990 to further reduce acid rain causing sulfur dioxide emissions by 50 percent. Under this market-based program, coal-fired power-plants can choose from a wide variety of control options in meeting their emission reduction targets, including demand-side management programs, switching to lower-sulfur fuel, installing scrubbers and buying emission credits. By providing the flexibility to innovate and rewarding superior performance with tradeable credits, the program has already spawned a wide variety of innovations in pollution control and prevention, including major advances in scrubber technology, fuel cleaning, fuel blending, and environmental dispatching. For example, U.S. vendors are now guaranteeing retrofit scrubbers at 98 percent control efficiency, whereas the ability to achieve even 90 percent control at existing units was in doubt just a few years ago. Moreover, the capital and operating costs of these improved scrubbers have dropped by almost 50 percent. The net effect is a more competitive pollution control industry and a much cheaper control program than was previously thought possible.

New Trading Programs for Air and Water Quality Management

Based on EPA's successful experience with the market-based acid rain control program and its provisions for trading sulfur dioxide credits, as well as previous experiences with trading programs, EPA is now developing a number of new trading programs for air and water quality management. EPA's Air Office is preparing to release its Open Market Trading guidance for ozone precursors and recently announced a new Clean Air Power Initiative that will look into the possibility of emissions trading for nitrogen oxides, mercury, and possibly even carbon dioxide. EPA's Water Office recently issued a policy to encourage effluent trading for water quality management and is currently developing detailed guidance. Such programs are beginning to spring up in watersheds around the country.

NOx Compliance Extensions for Innovative Technologies

EPA's air program has agreed to extend compliance deadlines for sources of nitrogen oxide if sources are willing to install new technology that will achieve superior results. Sources of nitrogen oxide pose serious threats to both human health and the nation's terrestrial and aquatic ecosystems. Atmospheric deposition of nitrogen oxides (NOx) is still one of the most intransigent air pollution problems facing the nation. Conventional control technologies are complex, costly and not as efficient as they could

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be to control this air pollution problem. Finding cheaper, more efficient alternatives to prevent or mitigate NOx emissions from over 54,000 industrial, commercial and institutional operations is essential to meet several of the nation's environmental goals, such as: attainment of Clean Air ozone standards; reductions in greenhouse gas emissions; habitat protection in ocean and estuarine waters, and long-range transport of NOx emissions.

Design for the Environment

The Design for the Environment (DfE) program encourages businesses to incorporate environmental considerations into the design of products and manufacturing processes. DfE is a voluntary, cooperative program that helps industry evaluate multiple alternative chemicals, processes, and technologies; compare their relative performance and risks to the environment in the earliest design stages; and organize collaborative efforts to develop and commercialize these innovative technological opportunities. Currently, DfE staff are working with the dry cleaning, printing, and computer industries.

RCRA Regulatory 'Quick Fixes'

1. Regulatory and Policy Tension Between Groundwater Protection Provisions and Aquifer Restoration Objectives. Federal and state legislation to protect groundwater resources generally precludes 'injection' of hazardous waste. However, such legislation does not always take into account situations where groundwater resources are already contaminated. Thus, a conflict was created because cost-effective remedial approaches often involve the extraction and partial treatment of groundwater (which is considered hazardous waste if contaminated), followed by reinjection with the objective of eventual restoration of the aquifer. Statutorily, Federal Land Disposal Restrictions do not preclude reinjection as part of a remedial action under CERCLA or RCRA corrective action and EPA has issued guidance to ensure that this is fully understood. Yet, there are instances where cleanups do not warrant CERCLA or RCRA attention. In such circumstances, application of existing policy to voluntary cleanups may be problematic. EPA will reinterate its existing policy, and suggest that regulators look favorably on beneficial reinjection projects, subject to an appropriate level of oversight.

2. Facilitate Increased Use Of In Situ Treatment In General, and Bioremediation In Particular, By Providing Higher Quantity Limits For In Situ Treatability Studies. The Treatability Study Sample Exclusion Rule (TSER) was revised several years ago to allow up to 10,000 kg of contaminated media to be excluded from RCRA manifesting and permitting. 10,000 kg is generally sufficient to pilot test *ex situ* technologies and provide meaningful data. However, the search for more cost-effective approaches to site remediation has led to increased interest in *in situ* technologies. Yet, 10,000 kg is

not sufficient to allow meaningful treatability studies on technologies such as soil vapor extraction or bioventing. Thus, a further increase in quantity limits for *in situ* approaches is warranted as long as the risk is determined to be *de minimis*.

3. Temporary Containment Buildings. Provisions regarding "Containment Buildings" were originally promulgated in the Debris Rule, 57 FR 37266, and are codified in the CFR at 40 CFR 264.1100-1103. The debris rule articulated the concept that containment buildings were to be significant structures (concrete floors and load bearing sidewalls). The use of less substantial, temporary structures to facilitate temporary hazardous waste remediation activities was not incorporated in the final rule. Yet such buildings were acknowledged in the preamble and favorable comments were received with regard to flexibility for temporary buildings erected for remedial action. Experience has shown that temporary containment buildings can ensure the necessary containment while controlling for such variables as moisture and temperature, thus increasing the performance and predictability of *ex situ* bioremediation. Thus, it is proposed that the applicable CFR regulation be altered to allow for temporary containment buildings to manage wastes associated with remedial actions such as bioremediation.

Superfund Risk Sharing for Innovative Technologies

EPA's Superfund program encourages the use of innovative technologies in Records of Decision (RODs) -- the legal documents that specify the remedy for a site. EPA has also introduced a new incentive to encourage Potentially Responsible Parties (PRPs) to develop improved methods for cleaning up Superfund sites by agreeing to share the risks of using innovative remediation technologies. For selected technologies, EPA will agree to reimburse PRPs for up to 50 percent of the cost of the innovative remedy, in the event that it fails and subsequent remedial action is required. EPA also encourages the sharing of technical information and requests specific documentation of the costs and performance of the innovative technology selected so as to establish a data base of applied technologies.

Innovative Technology in Waste Management Programs

The Office of Solid Waste and Emergency Response (OSWER) has issued a policy directive affirming EPA's commitment to technology innovation by providing additional flexibility to support the development, demonstration and application of treatment technologies, particularly those which address groundwater contamination and those which involve potential for significant cost savings by treating wastes *in situ*. Additionally, there is the potential for significant payoff in productivity and cost savings through increased use of field measurement and monitoring methods. Innovative technology development and demonstration will be enhanced by bringing together increased regulatory flexibility with the desirable attributes of federal facilities. EPA

understands that public-private partnerships are needed to bring about breakthrough technologies and is willing to support such partnerships by sharing the risk of failure of promising innovative approaches.

ReFIT

Under the Environmental Technology Initiative, EPA has established the Reinvention For Innovative Technologies (ReFIT) program to strengthen incentives for the development and use of promising new technologies. ReFIT is a "change agent" working to improve the environmental policy framework by supporting more than 40 action-oriented projects, demonstration programs, and policy initiatives throughout the United States. These projects are helping federal, state and local efforts to reinvent environmental management by injecting more flexibility into government policies, programs, and procedures, while ensuring improved environmental results. ReFIT is also an "information broker," working to provide information on current reinvention efforts to regulators, permit writers, technology developers, financiers, consulting engineers, the regulated community and the public. ReFIT is improving the existing regulatory system by moving from "command-and-control" approaches to performance-based systems that reward innovation. Examples of ReFIT's diverse portfolio of programs include:

- Innovative Technology and Pollution Prevention in Title V Permits Program (IT-P4). ReFIT is sponsoring a new federal/state/industry partnership to promote technology innovation and pollution prevention by developing innovative, performance-based operating permits under Title V of the Clean Air Act. This partnership builds upon the successful joint effort by Intel Corporation, Oregon's Department of Environmental Quality, and the EPA which resulted in the first flexible Title V permit in the nation for Intel's Aloha facility in Oregon. The Intel permit provides an important model of environmentally protective permit flexibility within Title V. However, different facilities possess different characteristics and each state's regulatory framework is somewhat unique. Therefore, the IT-P4 program is developing partnerships involving 5 different facilities in 5 states with the long-term goal of making permit flexibility, technology innovation and pollution prevention a routine way of doing business for all facilities. These new models of permit flexibility will be integrated into the Title V regulations and operating guidance, thereby improving Title V implementation nationwide. Over the next few years, tens of thousands of facilities throughout the country will be required to obtain Title V permits. Many could benefit from the new models of flexibility that will be developed by this program.

- Inter-State Cooperation in Permitting: Under the ReFIT program, EPA is supporting the National Governors Association and six major states in an effort to overcome interstate barriers to technology innovation. California, Illinois, New

Jersey, Massachusetts, Pennsylvania and New York signed a Memorandum of Understanding on June 4, 1996 committing to conduct a pilot program to evaluate 12 technologies, to develop a standard format for information exchange, and to establish a coordinated, streamlined procedure for reciprocal permitting of innovative technologies. NGA will analyze the results of the 6-state process, sponsor a workshop to obtain broad stakeholder input, and then write a report on how this type of process could be implemented at the national level. The report will be distributed nationally by NGA and EPA. The ultimate goal of this partnership is to enable innovative technology developers who have gone through the time and effort of getting a technology approved for use in one state, to later get the same technology readily accepted in another.

- Multi-Media Regulatory Approach for the Pulp and Paper Industry. ReFIT is working with the Wisconsin Department of Natural Resources (DNR) to create a multi-media regulatory structure to remove barriers to innovative technology and pollution prevention in the pulp and paper industry. The current single-media environmental regulatory structure has, at times, resulted in undesirable cross-media transfer of contaminants, or increased volumes of pollution. A multi-media approach to regulating this industrial sector will provide Wisconsin DNR with the capability to evaluate the environmental impacts of a facility as a whole, rather than as a series of fragmented parts. 38 pulp and paper facilities operate in Wisconsin; they have produced 4.7 million tons of paper annually over the past 40 years. Wisconsin DNR and 28 members of the Wisconsin Paper Council have entered into an innovative joint partnership to establish pollution prevention priorities in the pulp and paper industry.

- Overcoming Barriers to Constructed Wetlands: Tres Rios Project in Phoenix: ReFIT is helping the Bureau of Reclamation, the Arizona Department of Water Quality and the City of Phoenix overcome federal and state regulatory barriers to the use of constructed wetlands as an alternative to traditional wastewater treatment and water reuse technology. This collaborative effort is helping to address NPDES issues, endangered species issues and other permitting and regulatory requirements confronting the Tres Rios project, as it is scaled up to full operation. The City of Phoenix claims this project has the potential to eventually save city ratepayers $300-500 million, improve water quality and enhance wildlife habitat in the Salt River watershed. The Tres Rios pilot permit will serve as a model for more than 20 other communities around the country which are also interested in using constructed wetlands solve their water quality problems.

- CBOT Recycling Partnership to Trade Recyclable Commodities. ReFIT is sponsoring the Chicago Board of Trade (CBOT) Recycling Partnership (a public/private consortium) in instituting an electronic commodities exchange for buying and selling recovered materials. In a unique collaboration, the states of

New York and Washington, the National Recycling Coalition's Recycling Advisory Council, the EPA's Office of Solid Waste and the CBOT are working to launch trading initially for three materials (glass, PET and HDPE plastic), and then add new materials and additional services continually to make the system more attractive to potential users. By improving the recycling marketplace, this project will assist the nation in achieving its recycling goals and contribute to a more sustainable, resource efficient economy. This historic initiative represents the ***ultimate*** in regulatory reinvention – it increases the efficiency of the existing market for recyclables, instead of resorting to traditional regulation.

Project XL

Project XL (Excellence and Leadership) is a program through which the federal government is cooperating with the states and selected firms to test on a pilot basis a new regulatory approach that provides incentives for industry to find innovative ways to achieve environmental goals. The program's purpose is to improve the environmental performance of U.S. industries by providing the option of following an alternative path to existing regulatory-driven compliance. The pilot program requires reductions in discharges below current regulatory standards in exchange for greater flexibility in achieving environmental objectives. The key elements of Project XL are performance, flexibility, accountability, and partnerships. It also requires long-term goal setting and regular reporting of results. This more flexible approach offers a win-win opportunity for industry, federal and state regulatory agencies, and society as a whole. The result will be a cleaner environment through a more efficient, less-costly regulatory system.

Mr. ROHRABACHER. Thank you, Mr. Gardiner.

We've been joined by Mr. Tiahrt. Mr. Tiahrt, do you have an opening statement?

No, okay.

Mr. Urh?

STATEMENT OF MR. JOHN URH, SALES AND MARKETING MANAGER, CETAC TECHNOLOGIES, INC

Mr. URH. Mr. Chairman, I have a picture of an analytical instrument.

Mr. ROHRABACHER. You have a picture of an analytical instrument?

Mr. URH. We were asked in preparing for this hearing——

Mr. ROHRABACHER. Is that the two-armed analytical instrument or is that the one the man is sitting next to.

Mr. URH. They work together as a team.

Mr. ROHRABACHER. They work together. All right.

Mr. BAKER. Could you tell the Chairman what that machine is and where it's made?

Mr. URH. That's a gas chromatograph manufactured by the Varian Corporation in Mr. Baker's district in Walnut Creek.

Mr. ROHRABACHER. I already guessed that.

Mr. BAKER. Where was that?

Mr. URH. Walnut Creek.

Mr. ROHRABACHER. Where Bob Dole spoke to 2,500 cheering people on Monday.

[Laughter.]

Mr. ROHRABACHER. Go right ahead.

Mr. URH. Thank you.

Mr. Chairman and the Members of the Subcommittees, I welcome the opportunity to appear before you on behalf of the Analytical Instrument Association.

Our industry's products are essential to monitoring the process of cleaning up and keeping the environment clean.

Members of AIA make analytical instruments and support products used to measure pollutants in the soil, water and air.

Along with our instruments, our members often develop what are called analytical methods for use with a given instrument.

A method is essentially a laboratory procedure followed by a chemist to ensure that target substances can be detected at specified levels. For example, detecting lead in drinking water at five parts per billion.

All methods must be approved by EPA, whether developed by EPA technical staff or outside the agency.

The existing circuitous route to EPA approval for a method is a significant barrier to introduction and adoption of new environmental monitoring technologies.

For the most part, the kinds of innovations we are developing in our industry would have the result of making environmental monitoring more accurate, more reliable, easier, faster, and cheaper.

My written statements offers some examples of the delays that have been encountered by members of AIA. The principal causes are the cumbersome and unpredictable method approval process and the inflexible and highly detailed nature of EPA's methods.

The combination of the two has the effect of freezing technology in its tracks.

Our recommendation is that EPA shift from the current prescriptive, analytical methods to a performance-based monitoring methods approach.

Performance based monitoring focuses on the quality of the data whereas currently the focus is on an inflexible adherence to a written cookbook-style method.

Performance based monitoring is designed to ensure that the chemist or lab technician conducting the analysis meets certain specific data quality requirements to ensure that they produce reliable, high quality data.

In short, performance-based monitoring methods change the focus to producing a quality result.

Performance based methods, when they are focused on data quality, instead of on cookbook procedures where the focus is on merely following the cookbook, are inherently flexible.

EPA would benefit from this because the number of methods that need to be approved by EPA would be reduced by allowing the application of advanced monitoring technology under existing methods. They would reduce paperwork and minimize the regulatory workload associated with new methods and modifications to existing ones.

The end result would be methods covering more pollutants and better methods to EPA's mandates.

We've been pleased to find that the EPA's become increasingly aware of the problems with the current analytical methods process and are currently examining a conversion to performance based methods.

However, we believe that legislation framing EPA's efforts is needed to ensure that the agency's examination is completed in a timely manner. Further, legislation would help ensure coordination and uniformity across all environmental programs and see that issues related to the administration, enforcement, education and acceptance of the new system are addressed.

We've been working with Congressman Bill Baker and others to draft appropriate legislation. Would like to thank Congressman Baker for his leadership on this issue. And we hope that legislation to remedy this problem will be available in the near future.

In conclusion, there's technology sitting on the shelf today that I cannot sell to the environmental marketplace because it is not included in an EPA method.

Thank you.

[The prepared statement of Mr. Urh follows:]

Written Statement of John Urh
of CETAC Technologies, Inc. on behalf of
the Analytical Instrument Association

Presented to the Joint Hearing of the
Subcommittee on Energy and Environment
and the Subcommittee on Technology
of the House Science Committee

June 20, 1996

Mr. Chairmen and Members of the Subcommittees, the Analytical Instrument Association ("AIA") welcomes the opportunity to appear before you today on the subject of the Federal Government's role in facilitating the use of new technology to improve the environment.

1. The Analytical Instrument Association

AIA is the leading trade association for producers of high technology analytical instruments and related products used generally in laboratories for chemical and biomolecular analysis. Our industry's products separate chemical compounds into their chemical components and then analyze and measure those components in quantities as small as parts per trillion. Together our members and their overseas subsidiaries, parents and affiliated organizations account for more than 85 percent of the estimated $10 billion world market for analytical products. Our industry is a global one and many of our US based members derive more than 50 percent of their revenues from overseas sales.

Our products are frequently used for environmental measuring, monitoring and compliance activities by environmental testing laboratories, a wide variety of industrial facilities and public utilities, and by government laboratories. Many of our members develop new and alternative analytical methods which then are submitted for approval to the various US EPA program offices.

2. The Benefits of New Environmental Measuring and Monitoring Technology

Stimulating the development and use of new environmental technology is most important in the area of environmental measuring and monitoring. Environmental monitoring ensures compliance with environmental laws. Without monitoring, it would be impossible to determine whether industry is meeting the effluent limits established by law and through the various permit processes. Environmental measuring and monitoring also is used to identify hazardous waste and to ensure that our drinking water is free of harmful amounts of contaminants. As we develop new technologies to further reduce emissions beyond current requirements, it is imperative that we have state-of-the-art environmental monitoring technology and methods that are capable of measuring at those reduced levels.

In addition to allowing environmental emissions at lower levels than previously possible, such new environmental monitoring technologies can offer improved methods that ensure greater accuracy and faster measurements - including a movement toward "real time" measurements.

It may come as a surprise to some that in testing to determine whether a particular waste sample is hazardous, many of the current analytical methods create a significant amount of hazardous waste. Our innovative industry has developed technologies that can eliminate or reduce the amount of hazardous waste that is generated by one of the currently prescribed EPA methods.

Yet another benefit is lower cost. According to our environmental lab customers, the cost of performing an EPA prescribed analytical method is significantly higher than performing a medical test such as that performed as part of a routine physical examination. Reducing costs are important in environmental labs where profit margins are between 1-4 percent. The use of new technology also may lower the cost of environmental measurements and compliance for both industries and municipalities. Lower per test costs also would allow more frequent monitoring for more pollutants.

3. The Current Approval System Inhibits and Delays Use of New Monitoring Technologies

Environmental monitoring is critical to ensure compliance with emissions and effluent standards, characterize hazardous waste and safeguard our drinking water, however the current system, which requires use of specific EPA approved analytical methods to perform environmental measurement, inhibits and delays for years the use of new environmental measuring and monitoring methods. The EPA methods are highly detailed and often specify the use of specific procedures and analytical instrumentation to prepare the sample and to perform the analysis. They must be precisely followed or the results will not be acceptable to auditors and to the company or municipality which has contracted for the test, as well as to the state environmental agency and to the US EPA regional and national offices.

While analytical monitoring methods continue to improve, the current EPA process for approving the use of new monitoring methods keeps getting slower and more bogged down. EPA is well aware of this problem and is working with interested parties to develop improved mechanisms for streamlining and expediting the process.

Our industry, which relies on the approval of new and modified methods allowing the use of our latest instrumentation, is greatly concerned that despite these efforts, the problem will become exacerbated as technology moves forward at a faster pace, as more methods are proposed for field applications and as EPA's methods-approval resources are reduced or directed to other priorities.

We would like to offer some examples of the kinds of delays that members of AIA have encountered in recent years in obtaining EPA approval of analytical methods using new technology in the Water and Solid Waste offices. For example, it took one company over five years from the time of first appearance as a proposal to final adoption to obtain approval for the use of microwave technology in sample preparation. This company notes that there is no uniformity in the process for producing a data package for the same method in the different

programs. Further, there is no clear timetable or priority system for handling methods approval requests. The company also reports that there appears to be no uniformity of the analytical methods for accomplishing the same goal. The chemistry for sample preparations for the analysis of solid wastes for the determination of metals like copper and iron are different in each program.

Another member of AIA reports that it took two years to obtain EPA approval for a new method which simply automated an existing method. It took the same company five years to obtain approval under the RCRA program for a method using plasma emission spectroscopy. The method approved was not technically different than that proposed five years earlier.

Another member developed a new sample preparation method using headspace analysis. The approval process took three years by which time the new sample preparation technique was obsolete.

Further, instrument producers and testing laboratories have been stymied by unnecessarily long delays in gaining permission to make very minor changes in methods. As previously indicated, the methods must be precisely followed or the results will not be acceptable.

The primary cause for the long delay in obtaining approval of new analytical methods appears to be the inflexible and cookbook type detail of the existing methods. Any change, regardless of how minor it may be, must be submitted to and approved by the appropriate program office. Further, as indicated above, there is no timetable for action or structure for the methods approval process, and there is little uniformity for methods approval among the various programs.

The current EPA system is also stratified. The lack of multi-program methods and a multi-program methods approval process requires applicants to develop a separate and different application for each program and to negotiate approval separately with each program office. The current program-specific approach to methods approval also acts as a disincentive and often makes it difficult for testing laboratories to justify investments in new technology since labs need to have a sufficient number of tests to justify the acquisition of expensive new instrumentation. In fact, the rigid specification and inflexibility of the current system may force testing laboratories to use more expensive technology or more environmentally risky practices when a simpler, less costly and safer approach may be more suitable.

4. EPA is Evaluating Moving Toward Performance-Based Monitoring Methods

We are pleased that EPA recognizes the problem and has taken steps in recent months to approve methods faster. Further, in recent meetings, the Office of Planning, Performance and Evaluation has expressed interest in further streamlining and expediting approval of environmental monitoring involving new technologies and a number of EPA offices are evaluating the use of performance-based monitoring methods in place of the current system. A roundtable on regulatory reform at the recent White House Conference on Environmental Technology included a recommendation in its report to the Vice President that EPA review its rules and internal procedures and revise those that may adversely impact the development and use of new environmental technologies. Monitoring was cited as an example of an area to be investigated.

However, while we enthusiastically support these actions and have pledged to work together with the appropriate offices of EPA on ways to expedite and streamline methods approval, AIA believes that fundamental changes must be made in the methods approval system, especially if a goal is to stimulate the development and use of new environmental technologies and to promote uniformity among the various EPA program offices. Specifically, we support an acceleration of the movement to performance-based methods.

5. EPA Should Adopt a Performance-Based Methods System

It should be recognized that performance-based methods are not a new concept. In the past they have been embraced by FDA, OSHA, and other Federal and state regulatory authorities.

Performance-based environmental monitoring methods, in which the focus is on the scientific results of the analysis and compliance with data quality assurance criteria without prescribing the particular procedures, analytical techniques, or instrumentation to be used, offers the greatest promise of substantially reducing methods approval times and stimulating the development and early use of new environmental technologies.

As indicated above, several EPA offices are evaluating the movement to a performance-based methods system. However, there is inconsistency among the program offices and no deadline for completion of the review of the benefits of converting to a performance-based system or how the transition should be accomplished. Instead of attempting to develop and implement the move toward a performance-based methods system on a program-by-program basis, we favor a coordinated and concerted effort that would apply to all environmental programs where analytical methods are used.

A performance-based system would allow EPA personnel to focus on truly new technology and the scientific quality of data. It would minimize the regulatory workload associated with modifications to methods resulting from technological innovations and reduce paperwork. The end result will be methods covering more pollutants and better methods to meet EPA's mandates.

At the same time, our customers in the testing laboratory industry tell us, performance-based methods will increase laboratory productivity and improve the quality of their testing and data, speed decision making based on monitoring, and reduce overall environmental monitoring and compliance costs.

By allowing the use of new technology and technology improvements, performance-based methods also will increase the export market for environmental products and make US environmental laboratories more competitive in world markets. Many environmental technologies and instrumentation developed by US companies are currently used in other countries, however their use is prohibited here because they are not included in approved methods. The ability to use such technologies will position the US environmental laboratory industry to be more globally competitive.

6. What Needs to be Done to Implement a Performance-Based Methods System

AIA supports the acceleration of EPA's development of performance-based methods and a process for implementing performance-based methods within all Agency program and administrative offices to cover all media and multimedia. Critical to the success of its effort are measures to promote and encourage the participation and representation of all affected parties and the development of a comprehensive plan for guidance, implementation and acceptance by all EPA regions, program offices and states.

As the first step in the process, we favor the creation of an advisory committee which would advise the Administrator of EPA within a specified period of time on a number of issues including: EPA rules and policies that are barriers to the development and acceptance of new or innovative environmental monitoring methods, defining what should be contained in a performance-based method such as the data quality assurance criteria, defining what documentation needs to be maintained by the testing laboratory, defining instances in which methods and modifications to methods need to be approved by EPA, and providing guidance on how performance-based methods will be administered and enforced and how the new program will be communicated to the regions, states and regulated community.

Following receipt of the advisory committee's recommendations, the Administrator would develop and implement a plan for establishing a performance-based environmental monitoring system covering all media and programs as well as an educational and communications plan to facilitate implementation and acceptance of the new system by all EPA regions, program offices and states.

Although several offices within EPA are examining the use of performance-based methods, legislation framing these efforts is appropriate and necessary. Legislation is needed to make sure that the matter receives the priority attention that it deserves and that the agency's examination is completed in a timely manner. Further, legislation would help ensure coordination and uniformity across all environmental programs and see that issues related to the administration, enforcement, education and acceptance of the new system are addressed. We currently are working with Congressman Baker and others to draft appropriate legislation which we would be happy to share with the Subcommittees.

In conclusion, there is a need for a coordinated and concerted effort to improve the analytical method approval process. Congress can play a critical role in this regard. We appreciate the opportunity to present our views and welcome working with both the Committee and the EPA to examine and implement our recommendations.

Mr. ROHRABACHER. Thank you very much, Mr. Urh.

And I'd like to say that Mr. Baker, as much as we like to kibitz and jab each other every now and then, has been a very active Member of this Committee and I look forward to working with him and working along with you to develop the type of ideas that you're suggesting today.

I think it's really very exciting concepts that you're proposing. Again, Mr. Baker's working on some legislation and I will be working with him and be a supporter of that.

Ms. Powers?

STATEMENT OF MS. JAN POWER, PRESIDENT, POWER AND ASSOCIATES CORPORATION

Ms. POWER. Good morning, Mr. Chairman. I want to thank you and the Members of both Subcommittees for inviting me here to testify today on such an important issue, and for one that I feel so passionately about.

Creating a national environmental policy to foster innovative environmental technology in the U.S. is a difficult task but we can and we must accomplish this to provide for more cost-effective solutions to environmental problems, to enhance U.S. competitiveness, and to keep American technologies born here from being lost overseas to investors, which we see happening time and again.

As you move forward in creating this important national policy, I ask that you keep certain touchstones in mind.

First, a strong, predictable national standard system is essential. We must avoid extreme shifts between over-regulation and over-reform.

The current preference for permanence in treatment in site remediation should be retained in a more flexible framework which recognizes that treatments of certain categories of sites is currently economically and technologically infeasible, such as our intractable problem with dense, non-aqueous phase liquids, which are threatening a huge portion of our national groundwater supply.

I think America is envied all over the world for its wonderful groundwater supply, and this one problem threatens its long-term viability.

While there are cases where stabilization and containment are appropriate remedies, because they are currently economically and technologically infeasible remedies, there are two important thoughts to keep in mind.

There are many on-site technologies, many of which are innovative, which can provide permanent solutions at costs which are competitive with contemporary containment measures.

For sites which are currently untreatable, a statutory back pressure must be devised to create incentives for innovative technologies to be developed in the future.

Federal restoration funds should be earmarked, as DOD funds are, so that the vast majority of these funds go to actual site clean-up, not overhead litigation and studies.

And we should rely more on nationally recognized professional organizations which set peer-reviewed consensus standards working in close conjunction with affected federal agencies to jumpstart innovative technologies into the regulatory framework.

The performance-based standards that are being developed by Mr. Baker and Mr. Urh also provide a wonderful avenue. I'm looking forward to working with them.

I've been involved with an innovative biotechnical company recently, I've been trying for 15 years to get their product approved in EPA. They have wide acceptance in Europe, eight countries in Europe and in Canada, and they have now recently been acquired by overseas Japanese, German and U.K. interests.

I think some of the things Mr. Baker is doing can be very helpful in stopping that, quote, brain-drain of our technologies.

Recent reforms that recognize that remedial wastes should be treated differently than newly-generated hazardous waste has many positive aspects, but strong national standards which are geared specifically to remedial waste are essential.

And it should not be forgotten that the use of traditional treatment technologies spurs innovation by giving entrepreneurs clear technical and economic targets at which to aim with their new technologies.

In closing, I want to commend both Subcommittees for holding this hearing.

I welcome your questions and your thoughts, and I thank you again for this opportunity to present my views.

[The prepared statement of Ms. Power follows:]

Testimony Before the Science Committee

Subcommittee on Energy and Environment

and

Subcommittee on Technology

U.S. House of Representatives

By Ms. Jan Geiselman Power

President and Chief Executive Officer
Power Associates Corp.

June 20, 1996

INTRODUCTION

Good morning Madam Chairwoman, Mister Chairman, and distinguished members, I am Jan Geiselman Power, President and CEO of Power Associates Corp. I have over 21 years of experience in environmental protection as an EPA Division Director, a member of a Superfund settlement organization, as Regulatory Vice President of a hazardous waste remediation firm, and now as a consultant to the waste treatment, biotechnical, transportation and real estate industries.

I greatly appreciate the opportunity to testify and commend the Subcommittees interest in investigating and correcting existing impediments to innovation in environmental technologies. This innovation is vital to support our need to find more cost-effective ways

to protect and enhance human health and the environment in the U.S., but also to maintain our international competitiveness. I fear that despite the best intentions, neither the present laws nor the current statutory and regulatory reforms relating to hazardous and toxic wastes which are currently pending will accomplish our overarching goal to facilitate the research, development and commercialization of innovative environmental technologies.

American scientists are world leaders in conceiving innovative environmental technologies, but in many instances these home-grown technologies are being lost to overseas ownership due to frustration in the domestic marketplace created by statutory/regulatory impediments. Your efforts here today are a critical step in assuring that environmental technologies do not become to the 1990's, what the electronics industry's loss overseas represented in the 1970's and 1980's.

NEED FOR STRONG NATIONAL STANDARDS

At the threshold of this problem is our national mood swing between environmental over-regulation and the inevitable instinct to it winnow back. This dynamic undercuts the stability and predictability of standards which are the *sine qua non* for innovative technology development.

At the present, no one can dispute that the current Superfund and RCRA programs have, in some instances, led to "treatment for treatment's sake" remedies which have squeezed out the use of innovative technologies as well as increasing cleanup cost by an order of magnitude, with no commensurate environmental benefits. It is also indisputable that there is no technology currently that in existence can, in a cost effective manner, remediate dense non-aqueous phase liquids (DNAPLs) which so threaten our precious groundwater supply. So, we find ourselves, under present law, at the extreme end of the spectrum.

Yet, current pending reform of both Superfund and RCRA on the statutory and regulatory level, may fling us to the opposite end of the spectrum by the revocation of strong national standards, removal of the preference for permanence and treatment, equating natural attenuation and containment with treatment, and establishing no treatment requirements for some compounds which are highly treatable at a reasonable cost...all these proposed changes undercut incentives for environmental innovation as surely as the present overly stringent rules do.

Let me hasten to add that I am in favor of enlarging the state role in hazardous waste cleanup, but to do so by eliminating national standards and relying instead on state discretion to set them will not foster innovation. To expect a system in which entrepreneurs may be faced with 50 sets of state standards is totally inconsistent with a national policy which fosters innovative technologies. National standards also remove the temptation for some states to overly weaken standards to attract industry.

POSITIVE ASPECTS OF PENDING REFORMS

There are numerous positive reforms pending which will help the environment and encourage innovative technology:

- Elimination of RCRA technical and procedural standards for site remediation
    - elimination of virtually mandatory incineration requirements for organics will open the way for innovative technologies
    - elimination of RCRA permit requirements
- Opening of the Voluntary Cleanup Market - over 500,000 sites

creating huge new market to attract innovation

- Enhanced lender liability will attract new capital into the market

- Remedy selection reforms based on reasonably anticipated risks and actual or planned land use, rather than relying on compounded worst-case risk assessment scenarios and hypothetical residential exposure

ON-SITE VS. OFF-SITE TREATMENT/CONTAINMENT

I also endorse recognizing cases where treatment is economically and technologically infeasible, and in those circumstances, acknowledging permanence and treatment preferences are inappropriate. Yet, one commonly misunderstood fact in the remedy selection debate is the cost-effectiveness of many innovative on-site technologies as compared to offsite-treatment and containment remedies. Technologies such as bioremediation, soil vapor extraction, soil washing and on-site thermal treatment are extremely competitive with traditional cap and contain remedies, and at the same time offer permanent rather than temporary treatment solutions

EAR-MARKING FUNDS FOR ACTUAL CLEANUP

Earmarking significant portions of cleanup funds for actual remediation, as opposed to studies and overhead, has been a very successful strategy at Department of Defense sites. This earmarking concept should be broadened to other federal agencies, as currently provided in the House Commerce Committee's Reauthorization of Superfund Act (ROSA). This earmarking not only has been found to speed the pace of cleanup, but creates a tremendous incentive and a vehicle for innovative technology research and development and commercialization. The

current system of spending significant amounts of money on engineering studies and litigation is counter-productive to innovation.

SUPERFUND PRESUMPTIVE REMEDIES

Superfund Presumptive Remedies, long hailed as a way to fast track the pace of Superfund remedial actions, can represent tremendous deterrents to innovative technologies. Presumptive Remedies seek to capitalize on experience gained at certain classes of sites, such as municipal landfills, PCB sites, and volatile organic compound-contaminated sites. Rather than conducting exhaustive studies on remedial alternatives, EPA, through Presumptive Remedies, pre-identifies technologies found to work at those categories of sites. The danger for innovative technologies lies in being recognized as an appropriate alternative, once a presumptive remedy has been finalized. Recently, the innovative bioremediation industry found that its highly cost-effective use at Manufactured Gas Plant (MGP) sites is not being considered by EPA despite a major effort to provide actual data on bioremediation's efficacy at MGP sites. Presumptive remedies must be flexible enough for easy and frequent updating as new technologies emerge.

MORE RELIANCE ON PROFESSIONAL PEER REVIEW ORGANIZATIONS

Accelerating, if not mandating, federal agencies' use and reliance upon on outside professional organization's standards and certifications to recognize innovative technologies would be a very constructive step Congress should take to foster innovative environmental technologies. Certain federal agencies, indeed, certain programs within EPA, automatically incorporate by reference these standards into their regulations. Multiple public policy benefits are realized from this

approach: federal agency resources are saved by this private sector effort; the rigorous peer review and consensus standard development process these organizations conduct discourages charlatans from even entering the system; and, the merit of new technologies is "jump-started" into commercialization by the protocols and standards being incorporated by reference into regulatory programs.

Another major impediment is solved by this approach. There is a major conflict between the exclusive ownership and uniqueness of an innovative technology and deeply ingrained notions by regulators that approving a "sole-source" technology is anti-competitive. As a former EPA Division Director, I remember a strong hesitancy on my part to approve something owned by only one vendor. To do that was, so I thought, tantamount to creating an exclusive market and a virtual sale for that vendor...an anti-competitive act.

This may seem a minor point, but it looms large in the list of institutional impediments blocking commercialization of innovative environmental technologies. Obviously, by their very nature, and their patent protections, an entrepreneur is attracted into the market because he or she has a better idea which is first and alone in the marketplace. Again, more federal agency reliance on professional organizations would greatly help in this area.

Some of the organizations already providing this invaluable service include the American Society of Testing and Materials, the American National Standards Institute, the American Institute of Chemical Engineers, and the American Society of Mechanical Engineers.

It is no criticism of EPA to state that these organizations are in a much better position to be responsive to new technologies and changes in the market place. With their broad array of private sector technical experts, and by working closely in conjunction with affected federal agencies,

these groups will always remain the best identifiers of the leading edge of technology.

EXAMPLES OF IMPEDIMENTS

Paradoxically, the Resource Conservation and Recovery Act, which has brought about major environmental improvements through cradle to grave management of newly generated hazardous waste has impeded innovative technologies for "old" historic remedial wastes. Technical and procedural standards created for "new" waste applied to remedial waste have placed a chilling affect on conducting cleanup in general, and have directly and adversely affected the use of innovative technologies.

RCRA Land Disposal Restriction (LDR) rules mandate use of Best Demonstrated Available Technology (BDAT). BDAT for organics is costly incineration because it achieves a 99.99% destruction and removal efficiency, and therefore is "best". Bioremediation can achieve about a 90% reduction but keep in mind that virtually all of the remaining 10% of contamination is not biologically available for release to affect human health or the environment, and can be conducted for 1/10th the cost. So which is "best"? A cleanup of a one acre surface impoundment with minimal contamination cost $36 million due to RCRA incineration-driven LDR requirements--bioremediation would have been an ideal alternative had not the rules prevented it.

At the same time, there are sites in which on-site incineration is the most cost-effective technology if a wide range of volatile and semi-volatile compounds are present at the site. The point is, site-specific flexibility is needed to choose the best traditional or innovative technology, without any pre-determined, absolute mandate making that choice absent the facts.

RCRA is one of the strictest environmental laws on the face of the earth, and yet it automatically incorporates by reference the adoption of the American Society of Testing and Materials (ASTM) standards. It is therefore ironic to share with you a case of a California-based innovative biotechnical company, Microbics Corporation, which has been lost to overseas investors because ASTM standards are not recognized under the Clean Water Act.

Micobics' scientists/entrepreneurs developed a method utilizing luminescent bacteria which provides a faster, less expensive and more precise means to assess toxicity than the fish bio-assay test recognized under the Clean Water Act regulations. In addition to the exacting peer review required for its ASTM standard, and despite the existence of close to 500 articles in scientific literature (over 325 peer reviews) confirming its validity, numerous requests by states for its use, and a continuing large and successful monitoring program by the City of Baltimore, Microbics' method is still unrecognized federally in the U.S.

Microbics' test is currently accepted in eight European countries and Canada, and is in process in Mexico. Its financing recently has been acquired by British, German and Japanese interests and it is presently being courted to move its headquarters from California to Britain.

Hopefully, the work your committee has initiated will eventually lead to creating a more welcoming environment for American scientists so that in the future they can stay at home.

Thank you.

MICOTOX ® STATUS

COUNTRIES WHICH HAVE STANDARDS/ REGULATIONS BASED UPON MICROBICS CORPORATION METHOD

United Kingdom

Germany

Sweden

Netherlands

France

Spain

Canada

Mexico*

Italy*

* In process

ON-SITE TREATMENT COMPETITIVE WITH CAP & CONTAIN REMEDIES

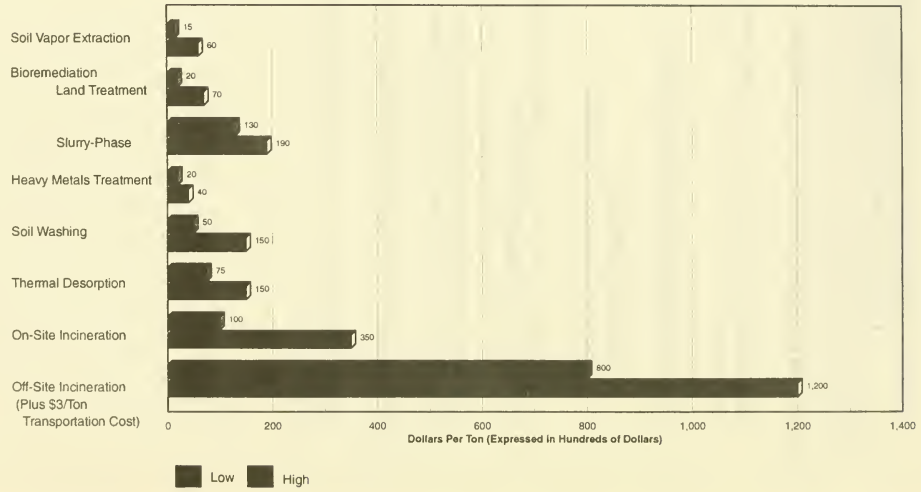
CAP & CONTAIN REMEDIES ARE COSTLY

- $260,000/Acre initial capital cost (assumes relatively small 20 acre site)
- 30 year minimum Operation & Maintenance
    - $50,000-$200,000/Year
    - represents conservative estimate
- Catastrophic failures of Cap & Contain remedies have occurred - economic and environmental disaster
- High cost with no progress - makes no sense to use as widespread remedy when on-site treatment so cost effective

STATES VERY CONCERNED WITH O&M COSTS -

- recognize permanence and treatment not automatically more expensive

Remediation Technology Treatment Cost Ranges



Designation: D 5660 – 95

Standard Test Method for Assessing the Microbial Detoxification of Chemically Contaminated Water and Soil Using a Toxicity Test with a Luminescent Marine Bacterium[1]

This standard is issued under the fixed designation D 5660, the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method (**1**)[2] covers a procedure for the rapid evaluation of the toxicity[3] of wastewaters and aqueous extracts from contaminated soils and sediments, to the luminescent marine bacterium *Photobacterium phosphoreum*,[4] prior to and following biological treatment. This test method is meant for use as a means to assess samples resulting from biotreatability studies. Sensitivity data for 1300 chemicals have been reported in the literature (**2**). The data obtained from this test method, when combined with respirometry, total organic carbon (TOC), biochemical oxygen demand (BOD), chemical oxygen demand (COD), or spectrophotometric data, can assist in the determination of the degree of biodegradability of a contaminant in water, soil, or sediment (**3**).

1.2 This test method is applicable to the evaluation of the toxicity (to a specific microbe) and its implication on the biodegradation of aqueous samples from laboratory research bio-reactors (liquid or soil), pilot-plant biological treatment systems, full-scale biological treatment systems, and land application processes (see Notes 1 and 2).

NOTE 1—If the biologically treated material is to be discharged in such a manner as to potentially impact surface waters and ground water, or both, then the user must consult appropriate regulatory guidance documents to determine the proper test species for evaluating potential environmental impact (**4**). Correlations between data concerning reduction in toxicity produced by this test method and by procedures for acute or short-term chronic toxicity tests, or both, utilizing invertebrates and fish (see Guides E 729 and E 1192), should be established, wherever possible.

NOTE 2—Color (especially red and brown), turbidity, and suspended solids interfere with this test method by absorbing or reflecting light. In these situations data are corrected for these effects by use of an absorbance correction procedure included in this test method (see 5.3, 6.1, and 6.2).[5]

1.3 The results of this test method are reported in terms of an inhibitory concentration (IC), which is the calculated concentration of sample required to produce a specific quantitative and qualitative inhibition. The inhibition measured is the quantitative reduction in light output of luminescent marine bacteria (that is, IC20 represents the calculated concentration of sample that would produce a 20 % reduction in the light output of exposed bacteria over a specified time).

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific hazard statements are given in Section 9.

2. Referenced Documents

2.1 *ASTM Standards:*

D 1129 Terminology Relating to Water[6]

D 1193 Specification for Reagent Water[6]

D 3370 Practices for Sampling Water[6]

E 729 Guide for Conducting Acute Toxicity Tests with Fishes, Macroinvertebrates, and Amphibians[7]

E 943 Terminology Relating to Biological Effects and Environmental Fate[7]

E 1192 Guide for Conducting Acute Toxicity Tests on Aqueous Effluents with Fishes, Macroinvertebrates, and Amphibians[7]

2.2 *Other Standards:*

Standard Methods For The Examination Of Water And Wastewater, 18th Edition[8]

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[1] This test method is under the jurisdiction of ASTM Committee D-34 on Waste Management and is the direct responsibility of Subcommittee D34.09 on Treatment.

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[2] The boldface numbers in parentheses refer to the list of references at the end of this standard.

[3] Toxicity measured as toxic inhibition of bacterial light output.

[4] Microbics Corp. is currently the only known supplier of the reagents (test organism *Photobacterium phosphoreum* strain NRRL B-11177) specific to this test method. There are two known manufacturers of analyzers that can be used to measure bioluminescence under temperature control: Microbics Corp., 2232 Rutherford Road, Carlsbad, CA 92008 (Microtox Model 500 and Model 2055 Analyzers), and Pharmacia LKB 9319 Gaither Road, Gaithersburg, MD 20877 (LKB Wallac Model 1250 and Model 1251 Luminometers). Other instruments would be considered when they become available. Please notify ASTM Subcommittee D34.09 if you are aware of any additional systems or instruments capable of performing this testing.

[5] At present (1993) use of the color correction scheme described in this procedure is known to be effective only with the Microbics Corporation's toxicity analyzers, due to the fact that the correction mathematics involve the detailed geometry of both the ACC and the light meter. Please notify ASTM Subcommittee D34.09 if you are aware of any other source of equipment capable of providing color or turbidity correction, or both, for the *P. phosphoreum test*. Data validating the absorbance correction procedure are available from Microbics Corp.

[6] *Annual Book of ASTM Standards*, Vol 11.01.

[7] *Annual Book of ASTM Standards*, Vol 11.05.

[8] Available from American Public Health Association, 1015 15th Street, NW, Washington, DC 20005.

3. Terminology

3.1 *Definitions*— The IC 20 is defined in terms of a modification of the definition of IC50 as it appears in Terminology E 943. The terms turbidity and volatile matter are defined in accordance with Terminology D 1129. These terms are as follows:

3.1.1 *color*—that is, the presence of dissolved matter that absorbs the light emitted by *P. phosphoreum* (that is, wavelength of 490 ± 100 nm).

3.1.2 *IC20*—a statistically or graphically estimated concentration of test material that, under specified conditions, is expected to cause a 20 % inhibition of a biological process (such as growth, reproduction, or bioluminescence) for which the data are not dichotomous.

3.1.3 *turbidity*—reduction of transparency of a sample due to the presence of particulate matter.

3.1.4 *volatile matter*—that matter that is changed under conditions of the test to the gaseous state.

4. Summary of Test Method

4.1 This test method covers the determination of acute toxicity of aqueous samples to luminescent marine bacteria, *P. phosphoreum*.

4.2 Wastewater samples are osmotically adjusted to the appropriate salinity for the test species *P. phosphoreum*. A sodium chloride (NaCl) concentration of 2 % has been found optimal for this test organism for freshwater tests, or about 3.4 % NaCl for seawater samples. This provides the necessary osmotic protection for the bacteria, which are of marine origin.

4.3 Samples should not be pH adjusted unless the user is not concerned about toxic effects related directly to pH. Altering the sample pH will usually alter the solubility of both organic and inorganic constituents of the sample. Altering the pH can also cause chemical reactions that will change the integrity of the sample, and greatly alter the exhibited toxicity of the sample. If sample pH is considered secondary to organism response, then the optimal pH for the bacterium *Photobacterium phosphoreum* is 6.7.

4.4 Comparison of inhibitory concentrations (IC20s) for untreated wastewater (or extracts of untreated soils) versus those for biologically treated wastewater (or extracts of treated soils), calculated from measured decreases in light output of exposed bacteria, allows for an assessment of the reduction in toxicity to the marine bacterium *P. phosphoreum* (see 1.1, 1.2, and Note 1).

4.5 Samples that are highly colored, or contain solids that can not be removed without seriously compromising sample integrity, can be analyzed using an absorbance correction procedure. This procedure determines the amount of light absorbed by the wastewater at a concentration near the nominal IC20 versus the baseline light output established by measuring the light absorbed by the clear diluent.

5. Significance and Use

5.1 This test method provides a rapid means of determining the acute toxicity of an aqueous waste, or waste extract, prior to and following biological treatment, and contributes to assessing the potential biodegradability of the waste (see 1.1, 1.2, and Note 1). The change in toxicity to the marine bacterium *P. phosphoreum* with respect to time may serve as an indication of the biodegradability potential. Sample analyses are usually obtained in 45 to 60 min, with as little as 5 mL of sample required (5).

5.2 Samples with high suspended solids concentrations may test nontoxic to the bacteria, while still exhibiting significant toxicity to freshwater organisms, due to those suspended solids.

5.3 The absorbance correction procedure included in this test method allows for the analysis of highly colored light-absorbing samples, by providing a means for mathematically adjusting the light output readings to account for light lost due to absorption.[5]

6. Interferences

6.1 Some test samples that are highly colored (especially red and brown) interfere with this test method, but the absorbance correction procedure can be used to correct for this interference.[5]

6.2 Turbidity due to suspended solids interferes with this test method. The absorbance correction procedure can be used to correct for this interference and is preferable to other alternatives. Pressure filtration, or centrifuging and decanting, will also remove this interference. Some toxics may be lost through adsorption and volatilization during filtration or centrifugation, thus impacting the exhibited toxicity.[5]

7. Apparatus

7.1 *Fixed or Adjustable Volume Pipetter*, 10 µL, with disposable tips.

7.2 *Variable Volume Pipetter*, 10 to 1000 µL, with disposable tips.

7.3 *Variable Volume Pipetter*, 1 to 5 mL, with disposable tips.

7.4 *Timer or Stopwatch*.

7.5 *Glass Cuvettes*, 11.75 mm OD, 10.5 mm ID by 50 mm height, 4-mL volume.

7.6 *Absorbance Correction Cuvettes (ACC)*—Optional item, but required to analyze highly colored samples or those containing suspended particulates.[5]

7.7 *Variable Voltage Chart Recorder (optional)*—Useful when using some types of light meters.

7.8 *Computer (optional)*—Useful with some light meters, for which software is also available, to facilitate data capture and reduction.

7.9 *Light Meter*, for cuvettes listed in 7.5.[4,5]

7.10 *Temperature Control Devices*, (temperature-controlled room, water bath, refrigerators, or other device—One capable of maintaining 5.5 ± 1°C and one capable of maintaining 15 ± 0.5°C).

8. Reagents and Materials

8.1 *Test Reagents:*

8.1.1 For purposes of this test method, test reagents are defined as the reagents actually used in performance of the test method. The necessary requirement with regard to qualification of test reagents is that this test method provide acceptable results when reference toxicants are tested using the test reagents.

8.1.2 *Microbial Reagent*—Freeze-dried *Photobacterium phosphoreum*. This is the only test reagent that is currently (1993) available from only one source.[4] While other accept-

alternate means of preservation may become available in the future. freeze-dried *P. phosphoreum* is specified in this test method because a large number of users concur in the opinion that the strain is well standardized by this method of preservation, and that the same strain does not provide comparable response to reference toxicants when preserved by other methods, or when freshly cultured and harvested at the user's laboratory, as described by Anthony A. Bulich et al (**1**). Another consideration is that a large body of published results, for which freeze-dried *P. phosphoreum* was used, has accumulated since about 1980, increasing the relevance of results obtained with this test method (**1, 2, 3, 5, 6**).

8.1.3 *Reconstitution Solution*—Nontoxic water.

8.1.4 *Diluent*—Nontoxic 2 % sodium chloride (NaCl), or 3.4 % NaCl, reconstituted seawater or sea water (depending upon the type of sample and purpose of the test). The *P. phosphoreum* test has been performed at osmotic pressures equivalent to 1 to 6 % NaCl, but has long been standardized at 2 % for freshwater samples. The major requirement is that the osmotic pressure be held constant within each test, to minimize transient variations in luminescence due to variations in osmotic pressure. The higher salinity (and osmotic pressure) of marine samples dictate the use of a diluent other than 2 % NaCl. Both reconstituted seawater and clean seawater have been used as diluent. A procedure for preparing reconstituted seawater is given in Table 8010:III of Standard Methods For The Examination of Water And Wastewater. Actual seawater has also been collected at remote sites and used as diluent for testing aqueous samples of marine origin. The most important requirement is that the diluent must be qualified for use with this test method (see 8.1.1).

8.2 *Reagent Chemicals*—Reagent grade chemicals are recommended for use in preparation of test reagents and reference toxicants. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society.[9] Other grades may be used, but there will be more risk that the resulting test reagents will fail to qualify (see 8.1.1).

8.2.1 *Sodium Chloride (NaCl)*—Used in preparation of diluent, and for adjusting the osmotic pressure of samples to that of the chosen diluent.

8.2.2 *Phenol, or Other Common Organic Toxicant*—Used as a reference toxicant.

8.2.3 *Zinc Sulfate Heptahydrate, or Other Common Inorganic Toxicant*—Used as reference toxicant.

8.3 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean reagent water conforming to Specifications D 1193, Reagent Water, Type I or II, Subtype A. Test reagents prepared from reagent water are to be qualified for use with this test method (see 8.1.1).

8.4 When this test method is used in conjunction with other tests employing higher organisms, appropriate dilution water for bulk samples should meet the acceptability criteria established in Section 8 of Guide E 729. In addition, all such dilution water used for comparative testing with this test method and invertebrates and fish, is to be assayed on *P. phosphoreum* (minimally once per month)

9. Hazards

9.1 The handling of wastewaters entails potential hazards due to exposure to chemical and biological contaminants. Appropriate safety measures, such as the wearing of protective clothing (gloves, apron, face shield, respirator, etc.) and maintaining proper hygiene, are utilized to minimize the chance of exposure. This test method is to be performed in a well-ventilated area.

9.2 Appropriate, environmentally safe procedures prescribed by regulatory agencies are utilized in the disposal of used waste samples.

9.3 Due to the presence of aqueous samples and electrical instrumentation in close proximity, care must be taken to prevent electrical shock.

10. Technical Precautions

10.1 Osmotic adjustment of freshwater test samples, to 2 % sodium chloride concentration, is required due to the use of a marine bacterium as a test organism. Osmotic adjustment may make some components of a wastewater less soluble, reducing concentrations in solution and altering exhibited toxic inhibition.

10.2 Samples containing highly volatile components are to be handled as little as possible to reduce losses due to stripping. Mixing procedures (see 13.8.4) are modified by performing only one pipet mixing per sample dilution versus the usual five pipet mixings. Volatile samples, which can be analyzed by UV spectrophotometry, allow the investigator to measure the average sample concentration of volatiles over the actual test period.

10.3 The addition of any preservative or other chemical agent, including acid or base to alter pH, will in all likelihood impact the exhibited toxicity of the sample. These practices should be avoided in most cases, unless the user is specifically testing to determine the effects of these sample modifications.

10.4 The use of a reference toxicant, such as phenol or zinc sulphate, is recommended for validation of data produced with different lots of test reagents (that is, bacteria, reconstitution solution, and diluent) or for individual lots used over an extended period of time. A good practice is to perform a reference toxicant analysis with each new lot of bacterial reagent received and new lots of test reagents prepared (or purchased). Under normal conditions, with reagent in good condition, tests on phenol produce an IC50 (5 min) between 13 and 26 mg phenol/L, and tests of zinc sulfate heptahydrate produce an IC50 (15 min) between 5 and 12 mg $ZnSO_4 \cdot 7H_2O$/L (or, 1.1 to 2.7 mg Zn/L). The corresponding nominal ranges are IC20 (5 min) = 3 to 6 mg phenol/L and about 1.5 to 4.5 mg $ZnSO_4 \cdot 7H_2O$/L (or, 0.34 to 1.02 mg Zn/L).

10.5 In order to verify that changes in observed toxicity are due to treatment, it is essential to have control samples for biodegradation test systems. Typical controls would be sterilized (autoclaved) waste samples. These samples undergo

[9] *Reagent Chemicals American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmaceutical Convention, Inc (USPC), Rockville, MD

toxicity assessment for comparison with the treated samples; that is, they undergo the same physical manipulations and testing as the inoculated or nutrient-enhanced treatment systems, but all microbial action has been terminated by sterilization at the outset of the test series. Autoclaving of samples for use as control samples requires special consideration and sample handling techniques. The following procedure is recommended:

10.5.1 Completely fill new borosilicate jars with sample, and seal them with autoclavable caps having TFE-fluorocarbon liners, to minimize loss of volatile toxicants during autoclaving.

10.5.2 Soil and sediment samples are to be moist, for optimal effectiveness of autoclaving.

10.5.3 Bring the autoclave to 121°C and hold the sample jars there for one to two hours, then turn off the heat and allow the autoclave to cool very slowly, to avoid large transient positive pressure inside the jars, which might cause them to fracture.

10.5.4 It is recommended that the autoclaving be repeated 24 h later as a precaution against survival of spores. In addition, or alternatively, commercially available spore strips or preparations may be added to a jar of soil and included in the autoclave load as a direct means of validating the effectiveness of the autoclave cycle.

11. Sampling

11.1 Collect aqueous samples in accordance with Practice D 3370. Soil and other solid material samples, for aqueous extraction, should be sampled in such a way as to reduce the risk of loss of volatile components.

11.2 All sample containers (vials or bottles) should be made of borosilicate glass that has been thoroughly cleaned using a nontoxic soap wash, HCl wash, and water rinse (twice). All sample containers should be sealed with TFE-fluorocarbon-lined caps.

11.3 Prepare all dilutions required for a single toxicity evaluation from the same treated or untreated wastewater sample. Portions of the sample shall be stored, until needed, at a temperature of 2 to 4°C in completely filled, tightly stoppered borosilicate-type glass containers. TFE-fluorocarbon-lined caps are used to seal collection bottles to minimize adsorption or sample contamination.

11.4 Uniformly disperse (by mild agitation), any undissolved material present in a wastewater sample, before withdrawing a measured portion for osmotic adjustment and subsequent analysis. Undissolved material, which will interfere with light transmission during analysis, should be adjusted for or removed as described in Section 6. Avoid violent agitation and unnecessary exposure of the sample to the atmosphere.

12. Calibration and Standardization[10]

12.1 Use the procedure specified by the manufacturer of whatever light-measuring instrument is being utilized. The procedure should include a mechanism for zeroing the instrument for no light production and a procedure for setting the output range.

12.2 If a chart recorder is being used, it should be calibrated against either the digital reading of the photometer or the voltage output of the photometer to the recorder.

13. Procedure[11]

13.1 Samples taken from a treatment process are collected using an ASTM acceptable sampling procedure (see Section 11).

13.2 For aqueous samples, visually evaluate the sample for suspended particulates and color. Both of these factors can interfere with measured light output readings. If either of these conditions is present use one of the methods described in 6.2 to remove or account for the interference.

13.3 For solid phase samples prepare the test sample as follows:

13.3.1 Wet sediment should be centrifuged to separate the pore water. Centrifuge 50 to 100 g of sediment at 2000 to 4000 g, for 10 to 20 min at 4°C. Decant the pore water and use the resulting pellet of solids as if it were a soil sample.

13.3.2 Homogenize 10 to 50 g of representative soil sample by hand mixing with a spatula for 10 min.,

13.3.3 Weigh a representative 3 to 5-g portion of the homogenized sample to the nearest 0.01 g, then air dry at 20 to 25°C for 16 h. After drying, reweigh the dried sample.

13.3.4 Take a 2-g sample from the homogenized soil or sediment and add 20 mL of the appropriate diluent.

13.3.5 Mix the soil/diluent mixture for 16 h using an orbital shaker set at 200 rpm.

13.3.6 Centrifuge the sample at 2000 to 4000 g, for 10 to 20 min at 4°C.

13.3.7 Decant 10 to 15 mL of the aqueous phase for use in the analysis of toxic inhibition.

13.4 Positive pressure filtration (through a prerinsed, glass-fiber filter) can be used to remove suspended solids, while minimizing loss of volatile organics. Rinsing the filter with nontoxic water, prior to sample filtration, reduces organic leaching from the filter. Note the potential sample alterations mentioned in 6.2.

13.5 Take 5 mL of the aqueous sample from 13.2 to 13.3 and measure the pH, dissolved oxygen (DO), conductivity, and salinity.

13.6 Adjust the sample salinity to either 2 % NaCl or 3.4 % NaCl (for samples of marine origin) by adding sodium chloride to 10 mL of sample. Adjust the pH and DO only if those factors are not concerns in the process under investigation. Be aware of the potential changes in overall sample chemistry as noted in 6.2.

13.7 If the user is adjusting the sample pH to determine the effect thereof, the acid or base, or both, used for the adjustment should be noted, and the quantity required in the adjustment should be recorded. Sample dilution and chemical species changes must be taken into account if pH adjustment is necessary.

13.8 Samples of unknown toxicity are screened, prior to definitive testing, using the following range finding procedure:

[10] Calibration and standardization procedures will vary depending on the instrument being used to measure the bacterial light output.

[11] This is a generic procedure that will require modification depending on the particular instrument being used to measure microbial light output.

13.8.1 Prepare a cuvette of bacterial reagent (*Photobacterium phosphoreum*) by adding 1 mL of reconstitution solution at 5.5 ± 0.5°C to a bottle of lyophilized luminescent bacteria and transferring the reconstituted bacteria to a cuvette maintained at 5.5 ± 0.5°C.

13.8.2 Prepare 10 test cuvettes, by adding 0.5 mL of diluent and 10 µL of reconstituted bacteria. Maintain the test cuvettes at 15 ± 0.5°C.

13.8.3 Without waiting the normal 15-min temperature acclimation period, place one of the test cuvettes of bacteria into the photometer, and measure the light output for 10 to 20 s. If the instrument used allows the output value to be adjusted, adjust the output to read 90 units. Otherwise record the output value as it is.

13.8.4 Add 10 µL of the unknown sample to the cuvette being measured. Mix the contents with a 250-µL pipet by aspirating and dispensing its full volume five times, or as an alternative, mix the contents by briskly flicking the cuvette with a finger (cuvette flicking method).

13.8.5 Measure the light output of the exposed bacteria for 10 to 20 s.

13.8.6 If the loss of light output is greater than 20 % within several minutes, dilute the sample ten-fold, and repeat 13.8.3 through 13.8.5 with one of the unused cuvettes prepared in 13.8.2 using the diluted sample. Repeat this procedure until a sample dilution produces a loss of light of less than 20 % during the first few minutes after sample addition. Observe the bacterial response for 5 min, and then estimate graphically the 5-min toxic response. This information gives the tester a good indication of the sample concentration range which will produce a statistically sound IC20, if the sample is toxic to that extent.

13.9 The procedure for running a toxicity test using *Photobacterium phosphoreum* is as follows:

13.9.1 Place 20 clean cuvettes in a temperature-controlled area at 15 ± 0.5°C, and one additional clean cuvette at 5.5 ± 1°C. Set the cuvettes in two rows of ten, and use a labeled test tube rack or other device to identify the cuvettes as A1–A10 and B1–B10.

13.9.2 Add 1 mL of reconstitution solution (nontoxic water) to the cuvette being held at 5.5°C.

13.9.3 Add the appropriate amount of diluent to Cuvettes A1–A9 (being maintained at 15°C) to obtain the desired concentrations after serial dilution (for example, for a 2:1 serial dilution, 1.5 mL of diluent is added to A1–A9). Cuvette A10 is left empty for the primary sample concentration.

13.9.4 Add 0.5 mL of diluent to Cuvettes B1–B10 (which serve as the test cuvettes).

13.9.5 Add 1.5 mL of the osmotically adjusted primary sample concentration (diluted or not) to Cuvette A10, and an appropriate amount to A9. Mix the diluted contents of A9 by aspirating and dispensing, by pipette, 500 µL of sample five times, or by briskly flicking the cuvette with a finger. Complete the serial dilution of the test sample by transferring an appropriate volume of A9 to A8 and A8 to A7 . . . A3 to A2, using one of the mixing methods previously described. In the example of a 2:1 serial dilution scheme, the dilution would be performed as follows: 1.5 mL of 100 % sample (note that the actual concentration is 91 to 100 % depending on the need for and method of salinity adjustment) added to Cuvettes A10 and A9 and mix A9, 1.5 mL of A9 to A8 and mix, 1.5 mL of A8 to A7 and mix, 1.5 mL of A7 to A6 and mix, 1.5 mL of A6 to A5 and mix, 1.5 mL of A5 to A4 and mix, 1.5 mL of A4 to A3 and mix, 1.5 mL of A3 to A2 and mix, and remove and discard 1.5 mL of A2.

13.9.6 Allow 5 to 10 min for samples to reach thermal equilibrium, then check to verify that the temperature of the reconstitution solution is 5.5 ± 1°C and that the test cuvettes have reached 15 ± 0.5°C.

13.9.7 While the prepared test cuvettes are temperature equilibrating, remove a vial of lyophilized bacteria from refrigeration and rapidly add the precooled 1-mL volume of reconstitution solution into the vial, swirl the vial to mix, and return the reconstituted bacteria to the cuvette which is replaced at a temperature of 5.5 ± 1°C. Mix the reconstituted bacteria by aspirating and dispensing 0.5 mL of solution, by pipet, 20 times. The reagent dilution is started within 5 min of bacterial reconstitution, in order to maintain maximum sensitivity.

13.9.8 Transfer 10 µL of reconstituted bacterial reagent to each Cuvette B1 through B10. Wipe the pipet tip of excess reagent before each transfer. Mix the contents of each cuvette using a 250-µL pipet to aspirate and dispense the solution five times, or by the cuvette flicking method.

13.9.9 Allow the bacteria in the test cuvettes to achieve a stable light output level by remaining undisturbed at 15°C for 15 min. This allows the bacteria to recover from the shocks of reconstitution, shift in temperature, and dilution of nutrients.

13.9.10 Cycle the cuvettes through the photometer, and adjust the light output levels to read between 80 and 100 units if possible (some units will automatically perform this task with the initial I_0 light readings). Cuvette output reading is performed in the order of B1, B2, B3 . . . B10.

13.9.11 Take the initial (I_0) readings by cycling the cuvettes, one cuvette every 25 s, and recording the light output of each cuvette (B1 through B10) for 5 s. Record the time with each reading so that the 5, 15, and 30-min exposure periods are accurately timed.

13.9.12 Start the addition of the test samples (Cuvettes A1–A10) to the test cuvettes (Cuvettes B1–B10) immediately following the reading of the light output of Cuvette B10, the last cuvette in the cycle. The addition starts with 0.5 mL of A1 (the nontoxic blank) added to Cuvette B1, mixing the sample by the pipet technique or flicking technique. The sample additions proceed from low concentration to high concentration, adding 0.5 mL of A2 to B2 and continuing up to A10 to B10, allowing 25 s between each sample addition. The time of each addition is recorded so that the light output of each challenged test cuvette can be measured 5, 15, and 30 min after the sample addition.

13.9.13 The test cuvettes (B1 through B10) are cycled through the photometer 5 min after the sample additions and the light output of the bacteria is recorded for each cuvette. This procedure is repeated at 15 and 30 min to observe any time-dependent increases in toxic inhibition (that is, toxicity due to metals).

13.9.14 The recorded light outputs are used to calculate IC values by plotting or mathematical determination.

13.10 The procedure used to correct for absorbance in

highly colored aqueous samples, as described in 6.1, is as follows:

13.10.1 Pipet 1.5 mL of diluent into the outer chamber of a clean absorbance correction cuvette (ACC) and place it in the photometer.

13.10.2 Pipet 1.0 mL of diluent into a standard cuvette (A1) and place it at 15°C.

13.10.3 Pipet 2.0 mL of sample of chosen concentration C_i (the concentration closest to the nominal ICxx) into each of two standard cuvettes (A2 and A3), and place them at 15°C.

13.10.4 Allow 10 min for the solutions to reach thermal equilibrium.

13.10.5 Pipet 50 µL of reconstituted bacterial reagent into Cuvette A1. Mix five times with a 500-µL pipet or flick the cuvette briskly.

13.10.6 Remove the ACC from the photometer long enough to transfer a sufficient amount of bacterial solution from cuvette A1 into the inner chamber of the ACC to get a volume level equal to that of the diluent level in the outer chamber.

13.10.7 Return the ACC to the photometer. Adjust the light output reading of the ACC to 90 units (if possible), then record the light output for 10 to 20 min until a stable baseline or steady drift baseline is established.

13.10.8 Using a clean aspirator, remove the diluent from the outer chamber of the ACC while the ACC remains in the photometer.

13.10.9 Remove as much of the diluent as possible with an aspirator. Transfer 1.5 mL of test sample from Cuvette A3 into the outer chamber of the ACC.

13.10.10 Record the light output for 10 min or more. The light levels recorded for the sixth through tenth minute will be used in data reduction.

14. Calculation

14.1 The following equations are used to determine 20 % inhibitory concentrations (IC20s) from light output readings produced using the methods described in Section 13:

14.1.1 Calculate the blank ratios (which will be used to normalize the Γ responses calculated in 14.1.2) for 5, 15, and 30 min, using the following equations:

$$R(t) = I(t)b/I(0)b \quad (1)$$

where:

$R(t)$ = blank ratio for time t,

$I(0)b$ = initial light reading for the blank cuvette (zero time, just before transferring toxicants), and

$I(t)b$ = final light reading for the blank cuvette (t min after transferring toxicants).

14.1.2 Calculate the 5, 15, and 30-min gamma responses, $\Gamma(t)$, for each of the eight test cuvettes, normalized for reagent pipetting errors and normal drift of luminescence with time, using the following equation:

$$\Gamma(t) = \text{Light Lost/Light Remaining} = [R(t)I(0) - I(t)]/I(t) = [R(t)I(0)/I(t)] - 1 \quad (2)$$

where:

$I(0)$ = initial light reading for any given test cuvette at zero time, just before challenging the organisms,

$I(t)$ = light reading for the corresponding test cuvette at time (t),

$R(t)$ = blank ratio for time t as defined in 14.1.1, and

$\Gamma(t)$ = Γ effect calculated for each exposure time (t), that is at 5, 15, and 30 min

It should be noted that $\ln \Gamma(t) = \ln (D/(1 - D))$, (see 14.1.4), is identical to Berkson's logit P/Q = logit $P/(1 - P)$ (7). The method described in this test method is, therefore, a logit analysis.

14.1.3 Use linear regression[12] of $\ln \Gamma(t)$ on $\ln C$, with $\ln \Gamma(t)$ as the dependent variable, to obtain the $\ln$-$\ln$ regresssion equation,

$$\ln \Gamma(t) = b(\ln C) + \ln a \quad (3)$$

then solve this equation for $\ln C$ to obtain the estimating equation,

$$\ln C = 1/b[\ln \Gamma(t)] - 1/b[\ln a] \quad (4)$$

where:

C = concentration of sample,

$\ln a$ = intercept of the $\ln$-$\ln$ regression line with the ordinate $\ln C = 0$, which will be a constant number, but different for each exposure time (5, 15, and 30 min),

b = slope of the $\ln$-$\ln$ regression line, which will also be a constant number, but different for each exposure time (5, 15, and 30 min), and

$\Gamma(t)$ = toxic responses for corresponding concentrations, for each exposure time (5, 15, and 30 min).

14.1.4 In order to find IC20s, solve the above estimating equation for C when $\Gamma(t) = 0.25$, corresponding to 20 % reduction of light output (see 1.3), for 5, 15, and 30-min data. These concentrations (Cs) are the IC20s for 5, 15, and 30 min, respectively. The relationship between Γ and percent reduction of light output (% D) is:

$$\Gamma = \% D/(100\ \% - \% D) \quad \text{or} \quad \% D = 100\ \% \times \Gamma/(1 + \Gamma) \quad (5)$$

It may be easily seen that IC20 (that is, % D = 20 %) corresponds to Γ = 20 %/(100 % − 20 %) = 20 %/80 % = 0.25. The estimating equation must be satisfied by these corresponding values of C and Γ. Substituting these specific values into the estimating equation results in the following:

$$\ln(\text{IC20}) = 1/b \ln(0.25) + 1/b \ln a = 1/b(-1.3863) + 1/b \ln a \quad (6)$$

Once the right side of the equation is reduced to a single number, say N, IC20 is the antiln of N. The antiln (N) is simply e^N, where $e = 2.7182818...$; that is, the base of the natural logarithms.

14.2 The following equations use data obtained in 13.9 and 13.10 to determine corrected light loss when a sample is highly colored and light absorbing or highly turbid, or both.[13]

14.2.1 Considerable labor can be saved when it is possible to calculate the values of A_i for all sample concentrations (C)

[12] Standard regression analysis should be used, with care given to make certain that the quality of the data warrants the conclusions drawn. The estimating equation reserves the variables compared to the conventional dose response curve to facilitate solution of the equation for C for a specified Γ. This estimating equation is simply the regression equation rearranged to make $\ln C$ a function of $\Gamma(t)$

[13] In samples where absorbance due to concentration does not behave in accordance with Beer's Law or the samples causing significant Γ responses (0.02 or larger) are turbid, or both, it is necessary to directly measure the absorbance in the ACC for each sample concentration toxicity tested that gave a significant Γ response, by this test method

based upon measurement of only one concentration (C_c) in the ACC, using the equation given in 14.2.2. When the sample is such that this approach is not applicable,[12] determine A_c for each concentration that yielded a significant Γ (that is Γ between 0.02 and 100) by direct measurement with each such concentration in the ACC. The equation in 14.2.2 must then be solved for each set of ACC data, I_0/I_F, with $C/C_C = 1$ in each case. It should be noted that A_C is considered to be zero for concentrations having Γ responses of 0.02 or less.

14.2.2 When applicable (see 14.2.1),[13] calculate absorbance due to color (A_C) for the ACC for all concentrations (C) of sample tested in the toxicity cuvettes which gave significant Γ responses, using the following equation:

$$A_C = (C/C_C)\,[3.1 - \ln(I_0/I_F)] \quad (7)$$

where:

A_C = calculated absorbance expected if concentration C were to be measured in the ACC, for each concentration tested in the toxicity test which gave a significant Γ.[13] (Alternatively, each A_C is calculated using I_0 and I_F results from direction measurements in the ACC.)
I_0 = initial light level, measured in the ACC (for diluent),
I_F = final light level, measured in the ACC (for C_C),
C_C = chosen concentration measured in the ACC (in 13.10),
C = each sample concentration tested in the toxicity cuvette, which gave a significant Γ (that is, 0.02 or larger), and
3.1 = composite factor for the ACC which corrects for geometrical differences between it and the standard test cuvette.[5]

14.2.3 Calculate the transmittance (T_C) of the toxicity cuvette for each sample concentration tested that gave a significant Γ, using the following formula:

$$T_C = (1 - e^{-A_C})/A_C \quad (8)$$

where:

T_C = unity (that is, 1.00) for concentrations having insignificant Γ responses, corresponding to A_C = zero.

14.2.4 Calculate the corrected gamma responses ($\Gamma_C(t)$) for 5, 15, and 30-min data for each concentration tested, using the following equation:

$$\Gamma_C(t) = T_C(1 + \Gamma(t)) - 1 \quad (9)$$

where:

$\Gamma(t)$ = Γ response observed for each concentration (C) in the test, at each test time (5, 15, and 30 min), and
$\Gamma_C(t)$ = color-corrected toxic response for each test time (5, 15, and 30 min).

14.2.5 Determine the color-corrected IC20 ($IC20_C$) for 5, 15, and 30-min data as described in 14.1.3, using the $\Gamma_C(t)$ values determined in 14.2.3 for each exposure time.

14.3 The following equation is used to correct the IC20s determined for soil and sediment samples in either 14.1.3 or 14.2.4 (if color/turbidity corrected) to dry-weight basis. The wet and dry weights of a representative soil/sediment sample were determined in 13.3.3.

$$IC20(t)_{DRY} = IC20(t)_{WET} \times (\text{dry weight})/(\text{wet weight}) \quad (10)$$

15. Data Interpretation

15.1 *Choice of Exposure Time*—the exposure time of choice is, in general, that which provides the greatest sensitivity. However, the IC20 having the smallest 95 % confidence interval may be preferred in cases in which the confidence interval varies appreciably with time of exposure. Consistency of choice between control samples and treated samples is of major importance for comparative studies. Finally, it should be noted that organics generally cause fast (5 to 10 min) response, while some metals continue to affect the luminescence of *P. phosphoreum* beyond 30 min. The changes in relative IC20 for the various exposure times as treatment progresses may, therefore, provide some additional information with regard to progress of treatment or further treatability, or both.

15.2 Compare the IC20 values (calculated concentration at Γ = 0.25) for the treated and untreated sample. Any toxicity reduction of 20 % or more, compared to the untreated system control sample or the raw starting material, is considered to be significant and a potential indication of biodegradability (see 1.1, 1.2, and Note 1).

15.3 Care must be taken to account for toxicity reduction that is not due to biodegradation (that is, adsorption, volatilization, and sample preparation errors). Control samples not exposed to biodegradation are essential as part of the data validation process (see 10.5).

16. Report

16.1 The record of the test and published reports of the results of the test should contain the following information:

16.1.1 Name of test, investigator, and laboratory; and the date the test was conducted;

16.1.2 Detailed description of the test sample including its source (detail biodegradation system used), composition (identity and concentration of major ingredients and major impurities), known physical and chemical properties, and identity and concentration of any solvents or other additives used;

16.1.3 The source of the dilution water, its chemical characteristics, and a description of any pretreatment;

16.1.4 Detailed information about the reagents used, including lot number, date received, reference toxicant data for the reagent lot, and any noted abnormalities;

16.1.5 A detailed description of the toxic inhibition analysis performed on the sample, including the test date, exposure times, test temperature, pH of sample before and after testing, all parametric data about sample, observations during test, and data reduction results (see 1.1, 1.2, and Note 1).

17. Precision and Bias

17.1 Quality data are produced when test procedures are followed as stated. The greatest source of error will be due to operator error. Errors are most likely to occur during sample preparation, salinity adjustment, filtration (if required), sample dilution, reagent dilutions, sample transfer and mixing steps, and data interpretation and resulting calculations. Use of the proper equipment and development of the appropriate skills required for using the test equipment are necessities in producing quality data.

17.2 Precision of the data may be improved by running a split sample duplicate analysis, repeating the procedures listed in 13.9 with the duplicate sample. Duplicate analyses can be performed simultaneously, or the duplicate sample

can be analyzed separately. The duplicate sample must be protected from incurring further biodegradation or other physical/chemical changes. The results of the duplicate analyses are compared for any irregularities (obvious differences) in response versus exposure concentration. If such irregularities are noted, the sample should be retested if at all possible.

17.3 The raw data generated by the test procedures will determine whether an IC20 can be calculated with reasonable accuracy.

17.4 The determination of 95 % confidence intervals, using an acceptable procedure, will assist the investigator in determining the quality of generated IC20s (computer programs are available to perform these calculations).

17.5 An interlaboratory comparison study (5) was conducted on the toxic inhibition procedure described in this test method. The study involved 18 laboratories in four round robins, during which a total of six blind samples (five toxic and one nontoxic) were analyzed. The coefficient of variation (CV) ranged from 14.29 to 18.57 for the pooled data set, while the overall CV (regardless of sample) was calculated to be approximately 17.8 %.

17.6 The lack of an internal standard for this test method makes it impossible to determine the bias.

18. Keywords

18.1 bioluminescence; bioremediation; contaminated soil; contaminated water; detoxification; marine bacterium; toxicity

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(4) For example, see: Pelletier, W. H., and Weber, C. I., "Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms," EPA/600/4-85/013, EMSL—ORD, Cincinnati, OH, March 1985; Weber, C. I., et al, "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms," EPA/600/4-89/001, EMSL—ORD, Cincinnati, OH, March 1989; Weber, C. I., et al, "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms," EPA/600/4-87/028, EMSL—ORD, Cincinnati, OH, March 1988.

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ANNOTATED BIBLIOGRAPHY OF BIOASSAYS RELATED TO SEDIMENT TOXICITY TESTING IN WASHINGTON STATE

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FINAL REPORT

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INTRODUCTION

This annotated bibliography was compiled during the author's part-time, temporary assignment to the Seattle District, U. S. Army Corps of Engineers (COE) under the provisions of an Intergovernmental Personnel Act (IPA) agreement. My primary task was to assist with the planning, coordination and review of sediment bioassays being conducted for the Puget Sound Dredge Disposal Analysis (PSDDA) program.

During the planning and review of bioassay projects with the COE, it became apparent that consistency in the use of bioassay methodologies between projects and contract laboratories needed some refinement. In addition, interpretation of the results of sediment bioassays was often problematical due to the interactive effects of multiple variables (e.g., exposure times, test temperatures, salinities, pHs, sediment grain sizes, etc.) and the lack of a historical perspective on past bioassays conducted in the Puget Sound region or in other geographical areas that may contain information germane to the local situation. Thus, this bibliography evolved as I reviewed past bioassay studies in an effort to provide a sense of continuity and conformity with past work.

This bibliography is directed toward the support of sediment bioassays being conducted in the Puget Sound region. However, it also includes information on water column bioassays which may contain methods or results pertinent to sediment assays. This is often the case since many sediment bioassays are adaptations of earlier water column assays (e.g., embryo/larval assays, Microtox).

The bibliography addresses seven basic areas:

Chapter

1. Methods—Protocols—Reviews
2. Amphipod bioassays
3. Embryo/larval bioassays
4. Polychaete bioassays
5. Microtox (bacterial luminescence) bioassays
6. Geoduck bioassays
7. Multiple testing protocols

The first chapter generally includes information on the conduct of bioassays in general. Chapters 2-6 contain entries specific to each of those bioassays. Amphipod bioassay citations focus primarily on tests conducted with *Rhepoxynius abronius*; embryo/larval citations deal primarily with oyster, mussel and echinoderm species; polycheate assays with *Neanthes arenaceodentata* testing; and multiple testing citations with studies that have used two or more assays concurrently (as is specified for PSDDA sediment testing). The entries in most chapters are subdivided into the following specific areas:

- Methodologies
- Sediment testing
- Water column testing
- Reviews and/or miscellaneous information

All entries are listed in the typical alphabetical/chronological style used in most "Literature Cited" sections of scientific reports or publications. For most of the annotated bibliographical entries, the following information is provided:

- A full literature citation
- A brief summary of the study

CHAPTER 5. MICROTOX

METHODOLOGY

Beckman Instruments. 1979. A fast, quantitative toxicity monitor. Chemical Engineering, July 30, 1979:39-40.

This is a short write-up under "New Products & Services" section which describes the new Microtox Monitoring System that is represented as a quick (~10 min) and sensitive alternative to standard 96-hr fish bioassays. This test system exposes luminescent bacteria to toxicants and measures the resulting light outputs. Toxicants usually cause decreased light emissions. The bacteria are lyopholized (= Microtox "reagent") for off-the-shelf convenience.

Microbics Corporation. Undated. The Microtox answer man. Answers to common questions about Microtox. Unpublished questions and answers about the Microtox System by Microbics Corp., 222 Rutherford Road, Carlsbad, CA 92008. 2 pp. Reprinted from Microtox World.

Questions and answers cover areas of light stimulation, use with freshwater and marine samples, effects of nutrients, viability and culture of the bacteria "reagent", effect of temperature, EPA approval, etc.

SEDIMENTS

Schiewe, M. H., E. G. Hawk, D. I. Actor and M. M. Krahn. 1985. Use of a bacterial assay to assess toxicity of contaminated marine sediments. Can. J. Fish. Aq. Sci. 42(7):1244-1248.

The authors used the Microtox bacterial bioluminescence assay to assess the relative toxicity of 18 natural sediments collected from Puget Sound. This study used an organic solvent extraction procedure instead of a seawater extraction. To support the use of solvent extraction, various candidate solvents were also assessed for toxicity.

Methods:

Sediments were collected from 18 Puget Sound sites by 0.1 m^2 van Veen grab and the top 2 cm only collected. Samples were frozen at -20 °C until used. Extracts were prepared by washing 100 g of sediment with dichloromethane and methanol by tumbling a total of 24 hrs. Extracts were measured for selected organic compounds and metals.

Bioassays exposed *Photobacterium phosphoreum* to sediment extracts for 5 to 30 min at 15 °C in a 2% NaCl matrix. The test endpoint = 15 min light reduction relative to controls and the subsequent calculation of EC50s. Various solvents were also tested for toxicity.

WATER COLUMN

Bulich, A. A. and D. L Isenberg. 1981. Use of the luminescent bacterial system for the rapid assessment of aquatic toxicity. ISA Transactions 20(1):29-33.

This article introduced the new Microtox luminescent bacterial test system (= marine bacterium, *Photobacterium phosphoreum* NRRL B-11177) designed to be a quick and sensitive bioassay tool. This article describes the basic operating system and provides a pictorial representation of the system. It also provides a synopsis of the responses of the Microtox system to pure compounds and effluents and compares these data to fish bioassays.

Methods:

Toxicity tests are conducted by adding reconstituted bacteria (the Microtox "reagent") to 2 ml test samples adjusted to 2% NaCl (to simulate the bacteria's native marine environment). The standard test conditions are: temperature = 15 °C, 5 min exposure time and the test endpoint = EC50 = point at which there is a 50% reduction in light emission. Test sensitivity can be increased by temperature adjustment over a range of 15-25 °C, increased exposure times (up to 15 min) and selection of different bacterial strains.

Results:

Comparative data are given for Microtox vs. fish assays for the following pure compounds and complex effluents:

Pure Compounds (mg/liter):

Toxicant	Microtox 5 Min EC50	Fish Assay 96 Hour LC50
Mercury II	0.065	0.01 - 0.9
Pentachlorophenate	0.5	0.21 - 0.6
Aroclor 1242	0.7	0.3 - 1.0
p-Cresol	1.5	3.5 - 19
Sodium lauryl sulfate	1.6	5 - 46
Ammonia (free)	2.0	0.068 - 8.2
Benzene	2.0	17 - 32
Zinc II	2.5	0.24 - 7.2
Malathion	3.0	0.07 - 19.5
Formaldehyde	3.0	18 - 185
Copper II	8.0	0.1 - 10.7
Cyanide (HCN)	8.5	0.1 - 0.44
Trinitrotoluene	20	26
Phenol	25	9 - 66
Chromium IV	70	29 - 133
Nitrate	420	19 - 230
1-Butanol	3300	1940
Urea	24,000	12,000
Ethanol	31,000	13,500
Isopropanol	42,000	4,200 - 11,130

invertebrate tests used both static and flow-through, 24 to 96-hr exposures of rainbow trout, fathead minnow, bluegill, sheepshead minnow, *Daphnia* and mysids; no other experimental conditions for these bioassays were given.

Results:

Five-min EC50s for Microtox with pure compounds were as follows (all in mg/liter; fish data are from the published literature):

Toxicant	Microtox 5 min EC50	Fish Assay 24 to 96 hr LC50
Mercury II	0.065	0.01 to 0.9
Pentachlorophenate	0.5	0.21 to 0.6
Aroclor 1242	0.7	0.3 to 1.0
p-Cresol	1.5	3.5 to 19
Sodium lauryl sulfate	1.6	5 to 46
Ammonia (free)	2.0	0.068 to 8.2
Benzene	2.0	17 to 32
Zinc II	2.5	0.24 to 7.2
Malathion	3.0	0.07 to 19.5
Formaldehyde	3.0	18 to 185
Copper II	8.0	0.1 to 10.7
Cyanide (HCN)	8.5	0.1 to 0.44
Trinitrotoluene	20	26
Phenol	25	9 to 66
Chromium VI	70	29 to 133
Nitrite	420	19 to 230
1-Butanol	3,300	1,940
Isopropanol	42,000	4,200 to 11,130
Urea	24,000	12,000
Ethanol	31,000	13,500

Generally, there were good agreements between Microtox EC50s and fish LC50s. There were also generally good agreements for the side-by-side effluent test results. Microtox effluent EC50s ranged from 0.032% to >100%.

For SLS tests, 81 EC50 determinations showed a mean value of 1.57 mg/liter with a CV of 18.2%.

Chang, J. C., P. B. Taylor and F. R. Leach. 1981. Use of the Microtox Assay System for environmental samples. Bull. Environ. Contam. Toxicol. 26:150-156.

The authors used the new Microtox Assay System to test the toxicity of various pure compounds, natural waters, pesticides and oil refinery effluents.

Methods:

Five-min EC50s were calculated for exposures to various compounds at 15 ±0.1 °C in a 2% NaCl matrix.

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Lebsack, M. E., A. D. Anderson, G. M. DeGraeve and H. L. Bergman. 1981. Comparison of bacterial luminescence and fish bioassay results for fossil-fuel processes waters and phenolic constituents. Pp. 348-356 *In*: Aquatic Toxicology and Hazard Assessment: Fourth Conference, ASTM STP 737, D. R. Branson and K. L. Dickson, eds. Am. Soc. for Testing and Materials, Philadelphia, PA.

The authors tested the toxicity of waste waters produced by a number of experimental oil shale retorts using Microtox and compared these results with rainbow trout and fathead minnow bioassays of similar waters.

Methods:

Oil shale retort process waters (Omega-9 water) were tested via Microtox using light diminution (EC50s) of *Photobacterium fischeri* as the endpoint. Tests were conducted at 15 °C in a 2% NaCl matrix with 5-min exposure times.

Results:

Rainbow trout were generally more sensitive and fathead minnows generally less sensitive to Omega-9 and similar process waters than Microtox. However, Microtox was generally less sensitive to phenolic compounds than either fish species, as shown in the following table (all concentrations in mg/liter):

Compound	Microtox EC50	Rainbow Trout LC50	Fathead Minnow LC50
Resorcinol	310	>100	100
Catechol	32	8.9	3.5
o-Cresol	32	8.4	18
Phenol	25	8.9	68
Benzonitrile	19	32	64
m-Cresol	8.2	8.9	56
p-Cresol	1.3	8.6	29
Hydroquine	0.079	0.097	0.044
Benzoquine	0.0085	0.13	0.045

Qureshi, A. A, K. W. Flood, S. R. Thompson, S. M. Janhurst, C. S. Inniss and D. A. Rokosh. 1982. Comparison of a luminescent bacterial test with other bioassays for determining toxicity of pure compounds and complex effluents. Pp. 179-195 *In*: Aquatic Toxicology and Hazard Assessment: Fifth Conference, ASTM STP 766, J. G. Pearson, R. B. Foster and W. E. Bishop, eds. Am. Soc. for Testing and Materials, Philadelphia, PA.

The authors conducted Microtox bioassays of single chemical compounds and complex effluents and compared the results with the results of rainbow trout, *Daphnia* and bacterial bioassays of the same toxicants.

Comparative results for the effluents are as follows (% volume/volume):

Effluent	Microtox 5 min EC50	Fish 96 hr LC50	*Daphnia* 48 hr EC50
Pulp Mills:			
PM-A	2.5	17	34
PM-B	8.4	37	NT*
Chemical Plants:			
CP-A	50 - 100	51	NT
CP-B	15	71	23
CP-C	40	7.1	NT
CP-D	34	NL**	39
Oil Refineries:			
OR-A1	6.5	71	78
OR-A2	50 - 100	NL	NT
Packaging Plant Dye Wastes:			
PP-A	1.5	0.9	0.3
Sewage Treatment Plant:			
STP-A1	>100	NL	NL
STP-A2	>100	NL	NL
STP-A3	30	43	16

* NT = not tested
** NL = non-lethal

Samak, Q. M. and R. Noiseux. 1980. Acute aquatic toxicity measurement by the Beckman Microtox. Summary of a paper presented at the Seventh Annual Aquatic Toxicity Workshop, Montreal, Canada, Nov. 1980. 17 pp.

The authors tested the toxicity of several pure compounds and several petrochemical effluents with Microtox. They also tested the toxicity of an effluent over a pH range of 5-9. Some comparisons are made with zebrafish (*Brachydanio rerio*) LC50s.

Methods:

Microtox tests were conducted as per the manufacturers recommendations (5-minute exposures, 15 °C and a 2% NaCl matrix). Zebrafish tests were static 72-hr exposures with moderate aeration.

Roughly 150 Microtox-related studies are referenced in this unannotated bibliography. It covers studies from 1974 to 1988 and each entry contains a Microbics library reference number.

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Mr. ROHRABACHER. Thank you very much for that concise and very to-the-point testimony.

Mr. Carroll?

STATEMENT OF PETER A. CARROLL, VICE PRESIDENT, GOVERNMENT AFFAIRS, SOLAR TURBINES, INC., ON BEHALF OF THE NATIONAL ASSOCIATION OF MANUFACTURERS

Mr. CARROLL. Mr. Chairman, Members of the Technology and Energy and Environmental Subcommittees, thank you very much for giving me the opportunity to come before you this morning to testify.

In the interests of time, I will summarize my remarks, but request that they be made a part of the record.

Mr. ROHRABACHER. Certainly, without objection.

Mr. CARROLL. My company, Solar Turbines, manufactures industrial gas turbines used in the gas and oil industry and for power generation and for industrial cogeneration.

Today I'm here on behalf of the National Association of Manufacturers, NAM, its 14,000 member companies, 10,000 of which are small businesses that you spoke to, Mr. Chairman.

We represent 85 percent of U.S. manufactured goods and almost 18 million employees.

Not too many years ago, it was popular to say that the service industry was the wave of the future for the United States. Manufacturing would move offshore because of labor costs.

Today we see that that grim prediction has not come true. Manufacturing is alive and well in the United States, and from our perspective at Solar Turbines, it provides the highest paying jobs to the broadest cross section of Americans for job opportunity.

Many factors have contributed to the strength of manufacturing. The willingness on the part of industries to take risk, the available capital for investment, innovations on the part of managers, engineers, and scientists, and of course new technologies.

Over the years, the United States has developed the greatest pool of technology in the world. Drawing on this has allowed American businesses to become ever more competitive through the application of new technologies, new materials, new processes, leading to the development of new products.

Today, I want to focus on the technology quotient of our success and how it is affected by current environmental regulations.

More than 20 years ago, my company in its research and development activities saw the need to focus on emissions technology. For industrial gas turbines, we categorize that as combustion technology. Over a 20-year span, we participated with many government agencies: NASA, the Department of Energy, the Department of Defense, state environmental and energy organizations, and a number of utility and gas companies.

Environmental technologies year in and year out consume the highest percentage of our R&D funds per system component.

How the Clean Air Act has lead the EPA to deal with technologies therefore is critical to our ability to compete at home and internationally.

But even more importantly, it has affected our ability to serve our customers who have need for higher efficiency reliable systems in their own industrial applications.

I want to speak to three factors that have affected the introduction of new technologies.

These are:

Uncertainties in applying for permits for new technologies.

The second, older proven technologies act as inhibitors to the selection of new technology for site applications.

And finally, the failure to link the conservation of fossil fuels to carbon emissions reductions and the EPA air quality goals.

Let me start with uncertainties.

Uncertainties is that issue that is absent in much of the permitting process in the United States today. For example, a plant manager or a small municipality, desiring to install electrical generation or co-generation facility, is required to make a significant investment in preparing a proposal to be submitted to the state for permit approval.

Frequently that review process is lengthy and calls for that permit to be returned to that factory for an iterative process.

The cyclical nature of that increases the cost and delays, the ultimate award, or possibly disapproval of that permit.

What this means to the industrial user is that capital that might be invested in new and innovative technologies to clean up the air and the water at that particular site goes elsewhere toward other cost savings or factory improvements.

The Clean Air Act, as interpreted, has forced the EPA to follow this plan. What is needed, therefore, and I think this has been said earlier this morning, is a regulatory system that requires all of us to meet reasonable environmental standards that can be administered in a simple, rapid, and sure way, providing investors with an opportunity of seeing that their money is put to work in a quick and rapid way.

The second category is that which inhibits the selection of technology. In terms of air quality, environmental regulators have attempted to rely on cleanup devices that have been quick fixes for the rapid reduction in overall emissions.

There is no doubt that this decision was effective and we have in fact made major improvements in air quality in the United States.

But the existing fixes are not the sole solution to our remaining pollution problems. To continue to implement these as the only approaches will add tremendous cost with little or no environmental gain.

Remaining air pollution problems require the use of promising, reasonable, cost-effective, and innovative technologies.

One example of that is predictive emission monitoring equipment which is much less costly than continuous monitoring equipment and is available but not authorized in the marketplace today.

Any new technology must necessarily go through a growth cycle. The rigidity of the current process has tended to resist the application of these new technologies.

Concepts such as the best available control technology and lowest achievable emission rate have done an outstanding job, but now's the time to tweak them to open the door for new technologies.

Finally, although within the EPA there are offices that deal with climate change, and they have expressed significant concern over the reduction in carbon usage, has failed to link with the Department of Energy or other agencies to focus on the importance of efficiencies.

It seems a significant omission in the environment agenda not to place a higher value on conservation. This could be accomplished through the use of high-efficiency systems without including or increasing regulatory standards.

The goals and requirements of our Clean Air Act should therefore be directly connected to a national energy strategy. When reviewing a permit, the EPA would place therefore equal importance on efficiency of a system to be permitted, balancing this against all pollutants at all other levels.

This does not happen today.

It's through efficiency that companies can afford to make the investments in new technology.

If you can reduce the cost of operations of electrical generation or heating for plant processing steam by five or ten percent, you now have capital available for new R&D or further emission reduction equipment, water cleanup and so forth. So efficiency is key to competitiveness for our industries.

In conclusion, I'd like to say that manufacturers need certainty in both as users and as producers of environmentally beneficial technologies. The BACT and LAER have worked extremely well in getting us where we are in terms of much lower emissions today, but now's the time to take a look at that and see what we can do to work with the EPA so that they reach out more to apply new technologies.

The new XL program looks very promising, and if that could be expanded, that may be a good forum to begin with.

More effort needs to be placed on the EPA to move away from our old solutions. And what seems to have driven this, we believe, is a focus on single pollutants, rather than looking at all pollutants. Reliance on nox with some CO and air pollutants only, and excluding water pollutants and other contaminants.

Catalytic recovery systems on large exhaust stream units, such as gas turbines, are expensive because of the ammonia slip, the ammonia used in that process, and the filter screens that need to be disposed of. All this is hazardous material.

Finally, I think it would be incorrect for me to come here and talk about problems with the environmental systems. I think there is much that has happened that is very good. We believe that where we stand today is at a significant opportunity where we can make some changes to the process we now have, look forward to the applications of new technologies, and keep America competitive.

Because I believe it's through the application of new technologies that we'll maintain high paying jobs, continue a high level of export, and keep the level of the economy that we enjoy in this country.

Thank you very much, sir.

[The prepared statement of Mr. Carroll follows:]

NAM National Association of Manufacturers

MANUFACTURING MAKES AMERICA STRONG

Testimony

of Peter A. Carroll
Vice President, Government Affairs, Solar Turbines Incorporated

on behalf of the National Association of Manufacturers

before the Subcommittee on Energy and Environment and
the Subcommittee on Technology
Committee on Science, U.S. House of Representatives

on Environmental Regulation: A Barrier to the use of Environmental Technology?

June 20, 1996

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- The U.S. share of world exports in manufactured goods is now 12.9 percent, up from 11.6 percent 10 years ago.
- Manufacturing provides the bulk of technological advances and innovation for the economy.

TESTIMONY
ON BEHALF OF THE
NATIONAL ASSOCIATION OF MANUFACTURERS

PRESENTED BY
PETER A. CARROLL
VICE PRESIDENT
GOVERNMENT AFFAIRS
SOLAR TURBINES INCORPORATED

ON
ENVIRONMENTAL REGULATION:
A BARRIER TO THE USE OF ENVIRONMENTAL TECHNOLOGY?

BEFORE THE
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
AND
SUBCOMMITTEE ON TECHNOLOGY
COMMITTEE ON SCIENCE, UNITED STATES HOUSE OF REPRESENTATIVES
WASHINGTON, D.C.

JUNE 20, 1996

Mr. Chairman and members of the Technology and Energy and Environment Subcommittees, I am Peter A. Carroll and I serve as vice president of government affairs for Solar Turbines Incorporated, a company that has manufacturing facilities in San Diego, Houston and Dallas. My company manufactures industrial gas turbines and turbine systems principally used in the oil and gas industry and for industrial cogeneration. I am presenting my testimony to you today on behalf of the National Association of Manufacturers (NAM). The NAM is the nation's oldest and largest broad-based industrial trade association. Its nearly 14,000 member companies and subsidiaries, including approximately 10,000 small manufacturers, are in every state and produce approximately 85 percent of U.S. manufactured goods. Through its member companies and affiliated associations, the NAM represents every industrial sector and more than 18 million employees.

Thank you for the opportunity to testify today on issues related to regulatory barriers to the development and use of environmental technologies. In the interest of time, I will summarize my remarks and respectfully request that the full text of the NAM testimony be submitted for the record.

Not too many years ago, it was popular to say that the service industries were the wave of the future for the United States and that, because of the labor costs, manufacturing would move off shore. Today we see that grim prediction has not come true. Manufacturing is alive and well in the United States. From our perspective at Solar Turbines, manufacturing provides the highest-paying jobs to the broadest cross-section of

Americans. Many factors have contributed to the strength of manufacturing: the willingness to take risks on the part of industries; available capital for investments; innovations on the part of our managers, engineers, and scientists; and, of course, new technology. Over the years, the United States has developed the greatest pool of technology in the world. Drawing on this has allowed American businesses to become ever more competitive through the applications of new materials and processes and the development of new products. Today I want to focus on the technology quotient of our success and how it is affected by our current environmental regulatory arena.

More than 20 years ago Solar Turbines' research and development engineers, along with the marketing organization, recognized the importance of emission controls and guessed correctly that sooner or later the country would awaken to the need for cleaner air and the protection of our environment. Over this 20-year span, we have participated with a number of government agencies working on combustion-emission reduction systems. These included NASA, the Departments of Energy and Defense, state environmental and energy organizations, and a number of our utility and gas companies.

Environmental technologies, or in our case combustion technologies, have consumed year-in, year-out the largest percentage of Solar Turbines' research and development (R&D) funds per engine component. How the Clean Air Act (CAA) has led the EPA to deal with new technologies is, therefore, critical to our ability to compete at home and internationally. But, even more importantly, it has affected our ability to serve the customers who have the need of higher efficient, reliable systems for their own industrial needs.

There are three factors that have affected regulations inhibiting the introduction of new technologies. These are: the uncertainty in applying for permits for technologies; older proven technologies that act as the inhibitors to selection of new technologies; and, finally, the failure to link conservation of fossil fuels to carbon-emission reduction and the EPA air-quality goals.

Certainty is the issue that is absent in the permitting process within the states today. For example, a plant manager or small municipality desiring to install an electrical generation or cogeneration facility is required to make a significant investment preparing a proposal and submitting that to the state for approval. This request for a permit comes after a lengthy engineering period, discussions with suppliers, normally competitive bidding, and, finally, a selection so that the permit will include the equipment to be sited and the proposed emission levels guaranteed from that equipment. The agency review process is lengthy and most frequently returns these applications with recommendations to look at alternative technologies, different equipment, or even different sizes.

Now the applicant enters into an iterative process where more engineering needs to be done, more pricing, estimating, planning, and resubmission. Although there are examples where permits are reviewed and rapidly approved, all too many examples exist where this process drags out for one to two years. Consulting businesses have blossomed to assist

companies in preparation of these applications, and law firms have established whole departments to get this paperwork through the process. What this means to a possible industrial user is that capital that might be invested in new innovative environmental technologies to clean up the air and the water at that particular site goes elsewhere toward other cost-saving or improvement.

The Clean Air Act has forced the EPA to follow this path. What is needed, therefore, is a regulatory system that requires all of us to meet reasonable environmental standards but can be administered in a simple, rapid, and sure way so that investors can, with comfort, select technologies and submit applications with a better understanding of when that investment can truly go to work.

The second category is that which inhibits technology selection. In terms of air quality, environmental regulators have tended to rely on cleanup devices that have been quick fixes for the rapid reduction in overall emissions. There is no doubt that this decision was effective and we have, in fact, made major improvements in air quality in the United States over the past twenty-five years. But, these existing fixes are not the sole solution to our remaining air pollution problems. To continue to implement only these approaches would be tremendously costly with little-to-no environmental gain. Remaining air pollution problems require use of promising, reasonable, cost-effective and innovative technologies. Yet, the previous success of the quick-fix cleanup devices has tended to stifle the application of new technologies where more economic solutions may come into play, solutions that would make products not only useful at home but suitable for export where we see growing environmental problems as the developing nations of the world become more industrialized. Any new technology must necessarily go through a growth cycle. The rigidity of the current process has tended to resist the applications of these new technologies. Concepts such as the best available control technology (BACT) and lowest achievement emission rate (LAER), which limit EPA's ability to approve manufacturers' use of innovative technologies, should be reviewed so that top down pollution prevention can begin to play a greater role in emissions reductions. This will mean looking at all pollutants at a given site and evaluating them in terms of the overall best environmental solutions -- solutions that will be based upon pre-agreed emission levels derived from sound, reasonable technology development plans.

Finally, although within the EPA there are offices that deal with climate change and speak to the importance of conservation, there has been no real connection between high-value energy efficiency and conservation programs within the Department of Energy (DOE) and standards of the EPA. It seems a significant omission in the environmental agenda not to place much higher value on conservation or efficiency because only through higher efficient systems can we reduce carbon emissions into the atmosphere. This can be accomplished through the use of high-efficient systems without increasing regulatory standards. The goals and requirements of our Clean Air Act should, therefore, be directly connected to a national energy strategy. When reviewing a permit application, the EPA would then place equal importance on the efficiency of the system to be permitted, balancing this against all other pollutant levels. Today this does not happen.

Conclusion

Technological innovation in any industry sector is inherently risky. This is an accepted part of our economic system, however. Unfortunately, when this inherent risk is artificially magnified by multiple layers of environmental regulation and bureaucratic rigidity, innovation is stifled much too easily. While we believe it was not purposely intended to inhibit new technology, our current environmental regulatory system creates *de facto* market barriers for innovative environmental technologies.

Manufacturers need certainty. They need to know that the EPA will approve a technology that they desire to install to improve the efficiency of their company's operations and contribute to cleaning up the environment. Otherwise they will invest their resources elsewhere. In addition, regulatory agencies need flexibility to allow them to approve innovative environmental technologies that are appropriate for site-specific circumstances, rather than relying strictly on BACT or LAER, which resist applications of new technologies and discourage thoughtful economic research and development. Finally, the EPA and DOE should coordinate energy efficiency and conservation activities with environmental standards to ensure an integrated approach to pollution prevention. These steps would go a long way toward encouraging the development and use of innovative environmental technologies.

The issue here is not whether health, safety and environmental regulations should exist. Their benefits are clear and the public supports the concept of regulation. The issue is how to enable the regulatory system to provide for these concerns without unreasonably impeding innovation, research, development and product approval. The regulatory system should encourage the EPA to work with industries to put in place R&D programs for new technologies that will meet pre-determined environmental standards. These standards should be established through industry-EPA agreement on what is technologically feasible within given R&D cycle times.

Thank you for the opportunity to testify before you today. I am prepared to answer any questions at the appropriate time.

Mr. ROHRABACHER. Well thank you very much, Mr. Carroll.

I'll start off with a few questions, and then we will proceed with the other Members of the Committee.

Mr. Gardiner, I thought it was fascinating that in your testimony, you mentioned a catalytic converters, which was just basically I believe, I don't know if it's the same technology that Mr. Carroll was just attacking.

Was that the same technology that Mr. Carroll was attacking that you had lauded in your remarks?

Mr. GARDINER. It is not the same technology exactly. The catalytic recovery system I'm speaking of requires a significant amount of ammonia. Automobile catalytic recovery systems are a different technology.

Mr. ROHRABACHER. Okay. Well, what I thought was interesting is that when you talked about, and let's look at the catalytic converter issue, I don't know the difference between the catalytic process that you're talking about.

Look, those of us who are Members of Congress, very few of us our scientists like Mr. Vern Ehlers, who has just joined us, who we rely on for his expertise dramatically.

But the fact is that most of us don't have the level of expertise he has.

I'm a former journalist. My basic knowledge on these areas is about that deep. I mean, I have a broad area of knowledge, as most journalists do, but it's not very deep, so we have to rely on our experts, and there are very few of them who've been elected to Congress.

So if I'm saying something, I'm sure I will be corrected, if I'm out of place here. But when you're talking about these catalytic converters—and again, I can barely change the oil in my car, okay,—when we mandated, did we mandate catalytic converters and wasn't this part of what Mr. Urh was talking about and Ms. Power was talking about in terms, shouldn't we have just mandated a goal, a clean air goal, rather than mandating that people have to have catalytic converters in their cars?

Isn't this an example of the old think that mandates the specific solution rather than the goals that need to be achieved?

Mr. GARDINER. Actually, the catalytic converters were not specifically mandated in the Clean Air Act. The standard was what was mandated by the Congress and so in fact it's a good example of a performance-based standard.

And that's part of the reason that I used it as an example, is that I think we support the approach that says we should set performance based standards.

I think Mr. Urh indicated in his testimony, with regard to the monitoring issue, the Environmental Protection Agency is actively considering exactly that change, and we're moving in the direction that he would like us to move.

I think we'd be happy to work with you and with Congressman Baker to see how quickly we could get there. I think we may be able to get there more quickly, frankly, without some legislation than we could with legislation, but we'd certainly be happy to talk with you about that.

But I think our commitment, we believe very strongly that performance-based approaches are good.

I would also note that we've had a number of projects under the Environmental Technology Initiative in which we've been basically moving to accelerate the progress by which we approve monitoring technologies.

And again, I think Mr. Urh and his organization have been supportive of those efforts. It's one of the great benefits, it seems to me, that we've achieved under the Environmental Technology Initiative.

Mr. ROHRABACHER. Although we have had some complaints about waiting five years for approval.

Mr. GARDINER. I absolutely agree. When I first came to the Environmental Protection Agency about three years ago, we received a complaint from a company in North Carolina that it took up to four years to get approved for the methods to measure hazardous waste.

We've cut that more than in half. And we intend to make further progress. We've got similar efforts underway in our water quality office to make similar improvements and those are the types of things that we've been funding with the Environmental Technology Initiative. We think they are yielding very positive benefits, not only for the country, but for the particular companies involved.

Mr. ROHRABACHER. Well, I thank you very much for that response, and again this is what these hearings are supposed to be about, so the Members of the Committee can learn, and especially guys like me who need to learn a lot about the technological end of it.

And it seems to me that when we're talking about flexibility in reaching these performance-based standards, and Mr. Urh, I really enjoyed your testimony, appreciated this idea of shifting the EPA away from basically being a regulator to being a monitor.

Is that basically what you were saying? Setting standards, then monitoring, rather than regulating how the process works?

Mr. URH. I'm a little uncomfortable with saying regulator because EPA has an enforcement role that they have to——

Mr. ROHRABACHER. Okay, how about manager?

Mr. URH. How about auditor?

Mr. ROHRABACHER. All right.

Mr. URH. What the focus now is requires, the way the methods are written now, it requires EPA to take a look at technology. At that point, maybe ten, fifteen years ago when some of these methods were written, look at what has to be measured, write a cookbook method that does that measurement, and then promulgates that out.

And what we're trying to say is don't worry so much about writing the cookbook. Tell us what the target is and as an industry, we can supply instruments to chemists and chemists can try and hit the target with whatever technique that's available to them.

Mr. ROHRABACHER. Tell them you want a cake——

Mr. URH. I'm sorry?

Mr. ROHRABACHER. They should tell you they want a cake but they shouldn't tell you how to build your oven.

Mr. URH. Right. If I could use that analogy a little bit further, if you use a cookbook method, it does not guarantee the same re-

sult. If you send samples, one sample that has say five parts per billion lead to 100 labs, you'll get close to 100 different answers. They will be within a range probably close to the right concentration, but you don't get all the same number.

There's a lot of reasons for that. It's a statistical thing that we're working with here. But different interpretations of the method can be different. If you're baking that cake, if you will, some people might take their tablespoon and fill it up at absolutely flat level, and put that ingredient into the mix. The next person will take that same tablespoon and heap it up, and it's a different amount, but they're both following the method exactly. The results will be different.

So a cookbook method doesn't guarantee a good number. Giving a target that the chemist has to shoot for is much more effective.

Mr. ROHRABACHER. All right.

Ms. Power, you suggested that American technologies were being driven overseas by regulatory barriers.

Maybe you could be a little bit more specific on that?

Ms. POWER. Yes, sir.

The specific case I'm thinking of, well, actually there are two. The generic soil washing industry, which was originally developed and used in the United States in the 1980s, and was judged against the standard of what incineration could do, and was an inappropriate expectation for that technology, and it was considered a failure, has pretty much gone over to Dutch hands now. That's a generic technology that has failed because of this problem.

Specifically, I'd like to bring to your attention a case, a California scientist who developed in the early 1980s, a bioluminescent bacteria that are capable of very sophisticated analytical readings of toxicity. And I believe that——

Mr. ROHRABACHER. Can you repeat that phrase again?

Ms. POWER. They have, they owned that—they——

Mr. ROHRABACHER. They developed a bioluminescent?

Ms. POWER. (continuing) —bacteria which have luminescent characteristics. You've probably seen it. Have you ever gone out to Laguna Beach at a certain time of year and there's a beautiful fluorescence.

Mr. ROHRABACHER. Red tide, it's called red tide.

Ms. POWER. No, no, not the red tide. It's when there's beautiful colors in the water. There's luminescent bacteria that are being washed on shore.

Mr. ROHRABACHER. I notice that happens at night when the red tide is in——

Ms. POWER. It happens at the same time?

Mr. ROHRABACHER. Yes.

Ms. POWER. Well, the red tide is bad, the luminescent bacteria are good.

But at any rate, these bacteria can be used in analytical methods to assess toxicity and currently EPA uses fish tests. They put fish in effluent. They swim around for four days, and then they decide which live or die and try and draw conclusions about toxic excursions at waste water treatment plants based on that.

This particular product can give you fairly automatic and more precise readings, very much more quickly, and at a lower cost, and

it has been accepted in eight European countries. In fact, this method also has an American Society of Testing and Materials Standard here, which is one of the finest technical peer reviews in the world, and they've validated this.

The company has about 325 international peer review papers that validate.

Mr. ROHRABACHER. So why aren't we using this here?

Ms. POWER. We are not using it here because, and I think you need to hark back to EPA has statutory responsibilities or equivalency, and I think this feeds right into a recent National Academy of Sciences study where it was pointed out that EPA and other federal agencies that do analytical work, need to move from an all-or-nothing equivalency approach to a screened iterative approach.

This particular product is a very powerful screening tool that can save you from doing all of the tests.

As a matter of fact, a lot of cases I've been working on very expensive analytical tests have been sent off and 80 percent of them come back with no detectable levels of toxics.

Mr. ROHRABACHER. So this is another situation where the government is trying to mandate the approach rather than mandate the exact result that they want to achieve, is that right?

Ms. POWER. Yes. And to their credit, I think they feel they have equivalency responsibilities under the statute. But in fact, I think we need to move to a broader approach where combinations of technologies are used which bring about the same result, but at lower cost.

Mr. ROHRABACHER. All right, maybe we should go back to Mr. Gardiner. Do you have a comment on that?

Mr. GARDINER. A couple of comments.

One is that just on the point about soil washing, that our most recent survey which looks at Superfund cleanup sites indicates that, in fact, soil washing is in use at 12 of those sites. So it's a technology which we have used and certainly we've been moving under the Superfund program to encourage the use of innovative approaches, of which soil washing is only one.

But we certainly think that they have the potential to achieve dramatic reductions in the cost of the cleanup at Superfund sites.

And as Mr. Roemer indicated in his opening statement, that has been something which has occurred already and which we hope to continue to move forward under the Superfund program.

Mr. ROHRABACHER. Okay. We have a lot of new Members who've joined us, Mr. Gutknecht, Wamp, and Foley and Chairman Walker. And out of respect for the Chairman of the full Committee, I'm going to ask if he has any questions or an opening statement?

Mr. WALKER. Thank you, Mr. Chairman. I'm just here to listen for a little while. Thank you very much.

Mr. ROHRABACHER. All right, and thank you.

We will now turn to the Ranking Member, Mr. Roemer, for any questions that he might have.

Mr. ROEMER. Thank you, Mr. Chairman. I appreciate that.

Certainly there seems to be some consensus on the part of our distinguished panelists here that some bad regulations can really influence in negative fashions or create market barriers for innovative environmental technologies.

Mr. Carroll, you, I think testified very well to that point. Since the state permitting requirements do seem to be one of the major barriers to environmental technologies. Mr. Carroll, might you start on this question?

Should Congress be considering changing the powers of states to issue environmental permits?

Mr. CARROLL. Let me make a little statement before that. I think that the current system does inhibit the use of new technologies. I don't think the solution is to determine whether the states ought to be issuing the permits or not. I think that the guidance that comes from you to the EPA is the determining factor in this. And if we had performance-based standards, in other words, if we were to say to all of the states, for a gas turbine, you will have these nox levels, these water pollutant levels, this CO level.

You now have established a criteria that engineers and scientists can design to. We can work with the national labs, we can work with our own people, we can work with consortia to solve these problems.

Today that's not the case. What you have right now is an open-ended situation where an applicant applies for a permit and that permit is measured against the best available, and that implies a high degree of uncertainty, because you never know what the best available is.

So I would go back and argue for performance-based standards, specific plateaus, and targets to work for, to use a cliche, if you really know where you're going, then it's important that you use the right road, and I think that would be the way I would approach it, sir.

Mr. ROEMER. And I don't think Mr. Gardiner would disagree with any of that. I think Mr. Urh's comments about moving to performance-based monitoring rather than the cookbook kind of examples that you mentioned, I am in complete agreement with that, and I think Mr. Gardiner is as well.

Is that correct, Mr. Gardiner?

Mr. GARDINER. That's correct.

In addition, I would say two things.

One is that we've actually been moving to change the best available control technologies standard that we have under the Clean Air Act, in fact, to allow more experimentation so that whether it's a federal permit or a state permit, that people would have greater opportunity to test innovative technologies.

The second thing that we've done at the state level and again under the Environmental Technology Initiative is actually to provide some funding to states so that they can, in the permitting process, actually introduce innovative technologies.

One of the burdens that states have is, as they have so many permits to issue, an innovative technology permit is a hard thing to do. It requires more resources. And so we've provided grants under the Environmental Technology Initiative to help states basically put more innovative permits out there for a variety of technologies and we think that's yielding some benefits.

Mr. ROEMER. Let me ask you another question, Mr. Gardiner, about one of the, I think, successes of the Environmental Technology Initiative. It seems to me that when you can help some of

our rural communities develop these drinking water pilots or packages where there are certain standards, there are certain requirements that some of my rural communities have to meet under the legislation that we passed here in Congress under the Safe Drinking Water Act.

Some of my rural communities and smaller communities don't have the tax base or the resources to meet some of these requirements, but the Environmental Technology Initiative puts together testing, they've put together verification protocols and test plans, independent testing, validation of package equipment, so that you don't have to put either unfunded mandates onto the states or make them increase their taxes to pay for something that is increasing the safety of their water.

That seems to me to be something that would help our rural communities and work in cooperation and in partnership with our local communities.

Can you tell me a little bit more about that, and whether there is any kind of disagreement with that kind of program?

Mr. GARDINER. Well certainly we don't disagree with it. We've supported it because it's been our sense that you're right, that local governments and particularly rural communities have a need for cost-effective, common sense environmental technologies, particularly for drinking water systems.

And we've not only funded under the Environmental Technology Initiative some further research on those technologies directly, but also as you indicated, the verification of those technologies. In effect, that is the way that local governments can get the best information about what the capabilities of those technologies are.

And it didn't seem reasonable for us to allow thousands and thousands of small communities around the country, or even if the states were to take this on, to have 50 some odd states try to work that all out, but instead that it seemed an appropriate role for the federal government to try to help local governments find the appropriate technologies, develop cheaper and more effective ones.

So we've made a major commitment to small drinking water systems under the Environmental Technology Initiative.

Mr. ROEMER. My last question for anybody on the panel might be—I agree we need to reduce paperwork, we need to make government more effective, we need to get rid of bad regulations.

We had some testimony a couple years ago from some people that were involved in the United Nations, saying that the Japanese and the Germans had 15, and 20 and 50-year plans to be involved in exporting energy and environmental technologies.

You know, I'm encouraged, Mr. Urh, by this picture and this example of some things going on in California. Where are we in terms of the Japanese and the Germans and competing with them?

Are you confident that we're not only going to compete with them, but beat them in the future as well?

Mr. URH. As far as the U.S.'s position in the analytical instrument industry, we are second to none. As far as market domination in the U.S., I don't have the numbers off the top of my head, but it's very hard for companies outside the U.S. to come and even make it here in the U.S. market because of the level of innovation that U.S. companies are able to maintain.

I wish I had some numbers for you right now. I could supply those later.

Mr. ROEMER. Please send those to the Committee. Thank you. Thank you, Mr. Chairman.

[The following information was received for the record:]

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7/15/96

Subcommittee on Technology
Committee on Science
2320 Rayburn House Office Building
Washington, DC 20515

Attn: Richard Russell
Bob Cook

Subject: Revisions to Testimony given June 20th 1996 at *"Environmental Regulation: A Barrier to the use of Environmental Technology?"*

During my testimony I was asked the following question by Mr. Roemer; "Where are we in terms of the Japanese and Germans and competing with them?" (HSY172.180 Page 56, Line 1230 to 1232) At the time I did not have any figures to support my assertion that the US analytical instrument manufacturers are doing very well in this marketplace. I now have those figures.

As far as balance of trade goes in our industry, according to US Dept. of Commerce figures, we are running a surplus of approximately $413,000,000.00 for 1995 which is up from approximately $400,000,000.00 in 1994.

US manufactured analytical instruments hold a 80.6% market share of the North American market and 58.6% of the worldwide market. If you combine goods manufactured outside North America by US companies you can see that the worldwide market share of US companies is 66.0%. These figures are from Strategic Directions International.

The bottom line is that US analytical instrument companies currently hold the dominant portion of the North American and worldwide analytical instrument market.

Thank you for the opportunity to submit these revisions to my testimony.

John J. Urh
Sales and Marketing Manager

Mr. ROHRABACHER. If I could follow up on that question. Mr. Urh, if Japanese and Chinese companies, for example, are privy to all the details of every American patent application, do you think that they might be able to go into production of some of these technologies before the patent is issued, if it takes a couple more years to issue the patent?

Mr. URH. Yes.

Mr. ROHRABACHER. That's what I was afraid of. Thank you.

Mr. Baker, do you have a line of questions.

Mr. BAKER. I do.

Mr. ROHRABACHER. Go right ahead.

Mr. BAKER. As it may surprise you.

Mr. Urh, Mr. Gardiner in his testimony said we've learned that setting performance-based standards and allowing the regulated community to find the best ways to meet them can bring about a cheaper, quicker, and better result than mandating design standards or specific technologies.

Do you see that happening today in reality when you go in with your new whiz-bang machine and you need a permit?

Mr. URH. Let me give you an example.

We introduced a product called an ultrasonic nebulizer 12 years ago. That was our first product that we really, that got our company going. That's when we were in our garage.

And it took until last spring, in April, we finally received a letter in writing where the EPA said, this product is acceptable to use under Method 200.7 of EPA methods.

It took us eleven years to get in writing from EPA that we could just use our product on an existing method. That's not even a new method.

So as far as the innovation happening? It's happening. Is it hard to get into the hands of environmental laboratories? It's very hard.

Mr. BAKER. Mr. Gardiner, as Vice President Gore put it in your testimony on page 7, the next generation of environmental policy must stress flexibility with increasing accountability and environmental quality. Without flexibility, we will not innovate.

You mention in your testimony, we don't need laws to get these flexibility standards moving, yet we hear examples of five years and eleven years.

Your good intentions apparently aren't trickling down to the application process.

What needs to happen in law to allow you to put your good words and your good intentions into effect?

Mr. GARDINER. Well, I would say at this point, we're not clear that changes in law are necessary. There may be some places where they are, but at this point, in terms of trying to make the changes that Mr. Urh and his associates would like to make, we don't believe that changes in law are necessary.

We certainly would welcome having further congressional support of the changes that we are attempting to make.

I want to clarify that I think there are two issues here that Mr. Urh is talking about. He can confirm this for himself.

I think one question is the establishment of the performance-based standard itself. And we are moving to go in that direction at

the Environmental Protection Agency, and have that actively under consideration.

The second is, if you come to the government, will you get swift turnaround on your application for approval? And that was his point—was that the application for approval has moved very slowly, and it is that second effort that we have been using the funding from the Environmental Technology Initiative to dramatically shorten the amount of time that it takes for an applicant to just get an answer from the Environmental Protection Agency.

And I want to say that I think we've made significant progress in the last three years. And frankly, I think one of the laws that you could pass that would help us is to give us the funding under the Environmental Technology Initiative so that we can keep doing the job that we've been doing to make this process shorter so that small businesses, like Mr. Urh's, can succeed and get their technologies into the marketplace.

Mr. BAKER. Okay. I'm sure the Chairman can disagree, but the reason for this hearing is because it isn't just one or two examples of eleven years and five years, it's thousands of examples.

It's not one or two small water districts and sewer districts that Mr. Roemer referred to, it's hundreds that have been sent, chased off after bacteria that doesn't even exist in their part of the country, but they are made by EPA to test for that, at the same time ignoring real problems that do exist in those territories.

It's the fact that EPA is going to mandate that only one company can analyze your automobile, rather than California and Virginia's standard of allowing auto mechanics to check for pollutants. We're not looking for the level of pollution, we're trying to tell them who is going to check the pollution.

In other words, we have an endemic systemic inflexibility in EPA.

And you say we don't need legislation to correct that, and you give one of the greatest speeches I've ever read talking about the need for performance-based standards and the need for flexibility.

Mr. GARDINER. And I think we have an excellent track record. I thought your question that you earlier asked me was directly to the question of what about monitoring.

But I would also argue that on the broader question of introducing flexibility into this system, I mentioned in my testimony Project XL, a specific experiment started by the President in which we have invited companies to come in and to tell us how they can deliver superior environmental performance, that is, greater environmental protection than they might otherwise under existing regulations, in exchange for regulatory flexibility.

Mr. BAKER. Okay, let me tell you what I think. You mentioned the catalytic converter. We've just invented a cleaner fuel in California. Hopefully we will burn less fuel because it has less performance standards, and we'll save in the pollution and we'll actually have an environmental plus out of this.

But we've invented a clean fuel. So not only do we have the catalytic converter but now we have a clean fuel. Hopefully with Livermore Lab's help, we'll eventually have the hydrogen fuel which will be completely pollutionless.

So we want to move on from being stuck in the catalytic converter era and move on to these other innovations.

What does EPA care who checks the car as long as it's clean?

But you do care. You pass these bureaucratic nonsensical regulations saying only one company, or only the state can check cars. Ridiculous. We're not performance-based.

I want to know how we can get there, and I want the cooperation.

The trick is to design a law that both moves us towards performance-based rather than bureaucratic based, and has your support.

In your speech, I have your support.

In reality, we're not getting there.

Mr. GARDINER. Well, my impression has been that under the Clean Air Act, in the inspection/maintenance area, in fact the Environmental Protection Agency has been moving aggressively with the states to give them the sort of performance approach that you articulate.

Mr. BAKER. No. They have to get a waiver. Virginia and California have to get a waiver in order to allow these high tech machines that check cars to be used by mechanics, rather than state bureaucrats.

Mr. GARDINER. Right. And the focus of that program has been on achieving the performance that we hope to achieve.

Mr. BAKER. No, the focus of the law, unchanged, is that the state shall do it. That's the law.

Mr. GARDINER. I believe it's the regulations and not the law and that we've been moving in the direction of having a performance approach for inspection and maintenance.

I would also say that we've——

Mr. BAKER. It's not true. The regulation or the law states the state shall do it. In order to get to performance standards, allowing an auto mechanic to do it with modern machinery, you have to get a waiver from the regulations and laws.

Why don't we change the regulation and law.

And my question to you, because this is vital to have your support of these changes, not your opposition.

What do we have to do to the law to bring about your good statements and sentiments and the wishes of industry into performance-based standards?

Mr. GARDINER. Well I think that the question that you ask is an extremely broad one. And it's hard to give an answer, because if what you're asking is what should we do to the entire body of environmental law, that's a complex question.

But I would argue that there are some, there's a wide range of opportunities that are available. I think we've recommended several. The Administration has supported several changes to environmental statutes that are under consideration in the Congress right now, like the Safe Drinking Water Act and the Superfund Program.

We heard some testimony this morning from Ms. Power that indicates in fact that we should not make the Superfund Program more flexible because in fact there are elements of the current Superfund requirement that drive the development of innovative technologies in terms of treating hazardous wastes.

Similarly, we heard testimony from Mr. Carroll who wants credit for the reductions that his technology gets for emissions of carbon dioxide, the prime contributor to the global warming problem.

Now the Chairman and I have discussed this issue before, and he believes that that's not a problem that we should move forward on.

The Administration disagrees and thinks that global warming is a serious problem and thinks that carbon dioxide is a serious pollutant.

We'd like to be able to give some credit for Mr. Carroll's technology for the carbon dioxide emission reductions that it achieves.

However, we have those who believe that this is not a problem, including the Chairman and other Members, and that is a barrier to Mr. Carroll's technology is that we are not, that we don't have a consensus yet politically that global warming is a problem and therefore that the gas reductions that he can get with his technology should be credited.

Mr. BAKER. Well, let's just focus then today on the environmental technology to this machinery in this narrow area then if it's too hard to——

Mr. GARDINER. As I indicated, we'd be more than happy to work with you to understand what you want to do with legislation and to help you understand what we're attempting to do in terms of changing our approach to monitoring technologies at the Environmental Protection Agency.

I think we, on that issue, share the same views.

Mr. BAKER. In very general, I want to codify your words.

Mr. ROHRABACHER. Thank you very much, Mr. Baker.

I would like to remind you that I haven't been Chairman here very long. After all, this is the third year or the fourth year of the Administration, and we could have expected some of these changes that you're talking about maybe to have occurred even prior to the time that I became a Chairman.

Mr. GARDINER. And I think they have, Mr. Chairman. I'd be happy to recite a long list of changes which have occurred. I welcome the opportunity. This is our first, I think, as Mr. Roemer indicated, to explain the benefits of the Environmental Technology Initiative.

Mr. ROHRABACHER. Let me note this. I'm looking forward to working in cooperation with you in those areas were we do agree. And there is a wide area where I have my doubts about the scientific validity and the basically the statements that people make about global warming. I have my doubts about those.

But there are a large number of other areas where we totally agree in terms of setting standards and making sure that we try to achieve those goals environmentally where there isn't any question about that, the harmful effects that things have on human beings and this planet.

Now, Mr. Tiahrt, would you like to proceed?

Mr. TIAHRT. Thank you, Mr. Chairman.

Mr. ROHRABACHER. And during this time, I will relinquish the chair to Mrs. Morella who has returned.

Mr. Tiahrt, you may proceed.

Mr. TIAHRT. Thank you, Mr. Chairman.

I also sat through the hearings that we had on global warming. I'm just curious because we have 15 years of data, from what I could gather. Ground temperatures seem to be warming over the last 15 years. Air temperatures seem to be cooling.

So I think we got more questions out of the hearings than we did answers.

That's not what I wanted to talk to you about. I just got some information here from I guess it's from the Office of the Comptroller and it talks about the Environmental Protection Agency's budget, it's the 1997 budget.

On a page entitled, Environmental Protection Agency Summary of the 1997 President's Budget Agency Resources, it says that the EPA's going to get about $7 billion in fiscal year '97.

Out of that, about $1.4 billion is going to go towards the Superfund.

What percentage of that will go towards environmental lawyers, will be consumed in the courts in litigation and within environmental lawyers?

Mr. GARDINER. I don't have a specific answer to that question, but I'd be more than happy to respond to you in writing and get you an answer to that question.

We've certainly looked at that issue and have made a number of administrative reforms at the agency to ensure that the focus of Superfund expenditures is on cleanup, and indeed we've all been subject to Congressional limits in our appropriations bills for a number of years that limit the administrative expenses that we can have.

We certainly also believe that the Administration's proposal for Superfund reform would also further reduce any, in essence, overhead costs to the Superfund program, and believe that Congress should be changing the Superfund law.

Mr. TIAHRT. Well, that's interesting. Ms. Power brought this out that we ought to actually earmark the funds for cleanup. I've sat next to a man that represents A.O. Smith Company in Ohio, which is one of the I think 100 sites that we've actually cleaned up in the last 15 years or 17 years. And they went back and assessed the costs and how much went towards litigation, went to the environmental lawyers, and he said 80 percent of the cost of the cleanup was consumed by lawyers.

And he's up here trying to reform the regulations. He says that it doesn't clean one drop of pollution, it's wasted, it's a waste of taxpayers money, and I just am curious because in your testimony where you talk about reinventing environmental regulation that supposedly has the support of the President, Vice President, Administrator Browner, yet I think it was last year, we had 17 reforms to the EPA, regulatory reforms, not changing any law, but just some regulatory reform that was opposed by the Administration.

It was passed by Congress and opposed by the Administration. So I see kind of a chasm here, a gap, between what the Administration says they will do and what you want to do, apparently based on your testimony, and what is actually happening.

And I'm curious. Is there ever going to be a reconciliation between what is actually said and what is actually done?

Will you put some report together that says this is the reforms that we think we can agree with, and I agree with you. It's much quicker to change and actually have reform by doing it through a regulatory change than it is my doing a legislative change.

Certainly won't have all these fights.

But I'm just curious as to how you're going to reconcile between what is in your testimony and what the Administration says they want to do, and their actual performance when they oppose regulatory reform.

Mr. GARDINER. I would just say that it's my impression that the Administration shares your concern about the expenditure of Superfund dollars on overhead expenses or legal expenses, and it's the reason that we have not only made administrative reforms at the Environmental Protection Agency, but I know that Administrator Browner has been a broken record on this topic, that she believes that the Superfund program is broken, and it actually requires legislative changes to the Superfund program, and we'd be anxious to see legislative changes pass the Congress this year.

Mr. TIAHRT. Let me remind you that Mr. Gore has said that this is the most environmentally unfriendly Congress that has ever been, and yet we have a common goal of regulatory reform.

Why are we being chastised in the press openly, and yet we have the same goal?

Can you explain that to me? I'm a little curious?

Mr. GARDINER. I think that we have disagreements about what some of the legislative proposals that we've seen may do in the way of environmental protection, and we've had on a range of issues deep concerns that some of the proposals would undermine environmental protections for the American public.

We believe that there are substantial reforms that can be made to the Superfund program, to the Safe Drinking Water Act, that would not only make the kinds of reforms that we need to make that will streamline those programs, but will also deliver better environmental protection for the American public.

Mr. TIAHRT. Then why was that not the message, rather than the message being this is the most environmentally unfriendly Congress that has ever existed?

Mr. GARDINER. Well, as I think any student of the last year and a half or so would say, there's been a very sharp disagreement between the Administration and the President——

Mr. TIAHRT. That's not what your testimony says the way we want to go towards reform.

Mr. WAMP. Will the gentleman yield?

Mr. TIAHRT. I'd be glad to yield.

Mr. WAMP. I just want to point out, because I actually agree with Mr. Gardiner that changes have been made, but let me point out where some of these changes are being made.

Clean Water Bill H.R. 961 last year was railed as the most, they called it the Dirty Water Bill, etcetera, etcetera.

The fact is EPA, and I've got the documentation here, has made quite a few of the reforms that the Clean Water Bill, the Clean Water Bill Amendments of 1995 recommended that we should make.

And while EPA railed against those reform measures as totally environmentally unfriendly, they are actually making many of those reform recommendations.

They're even already making many of the reforms that our Superfund Bill, which hasn't been brought before the Commerce Committee or the Transportation Committee yet, is recommending in H.R. 2500.

So it can't be all bad, Mr. Tiahrt, because they're actually doing a lot of what we recommended. It's just politically beneficial to say everything's terrible, the sky is falling, but they are embracing them, and I can give you different programs within the EPA where they're actually adhering to the recommendations that we proposed last year in H.R. 961.

So I think you're right, it's gone a little overboard.

I yield back to you.

Mr. TIAHRT. In reclaiming my time, that's where I'm wondering where is the reconciliation between what has been said and what is being done? When will that come to the press? When will that press conference be? Because I would like to be there.

My children are not genetically superior to any other children in America, and yet the Administration acts as though I'm trying to create some dirty water here because my kids are genetically superior and they can stand this additional pollution.

They can't. I want clean water, I want clean air, I want to work for regulatory reform, but I want to work together with the Administration. I don't need this fight.

And so I would encourage you to continue with the reforms, let us help if we can, let us get out of the way if that's what it takes, but don't make it a big gap between what is said and what is done.

I yield back the balance of my time.

Mrs. MORELLA. I'd like to ask Mr. Gardiner, I know you had an appointment at 11:30. Can you stay a little longer?

Mr. GARDINER. I have an airplane that I need to catch at 1:00 so I've got until about quarter of, and that's about my limit.

Mrs. MORELLA. Thank you very much.

And then we're going to ask that members of both Subcommittees be allowed to forward questions for responses?

Mr. GARDINER. Absolutely.

Mrs. MORELLA. Splendid.

The next person I'd like to recognize is the gentleman from Pennsylvania, Mr. McHale.

Mr. MCHALE. Thank you, Madam Chair.

My questions will have to do with the subject of brownfields, and I'm hesitant to get into partisanship here or to trade accusations with my good friends on the other side of the aisle, but while there is a great deal of common ground between the Administration and the Republicans on this Committee in certain areas of reform, Mr. Tiahrt pointed out that commonality, there are also areas of honest intellectual disagreement, and we need to be aware of those as well.

If we fail to recognize that disagreement, then we give rise to the charge of, in effect, hypocrisy that was discussed a few moments ago.

With regard to the revisions to the Clean Water Act, while there are some reforms in that bill, as advocated by Mr. Schuster, now being implemented by EPA, there are also substantial differences.

That legislation would have delayed dramatically any meaningful effort to curb non-point source pollution, something that in the State of Pennsylvania is extremely important with regard to the Susquehanna Basin.

There may be an honest difference of opinion on that subject, but we need to recognize that difference of opinion, and there are those of us who believe that such a delay is inexcusable.

Budgetary constraints also raise differences of opinion. The fact of the matter is that the Republican agenda would have called for a one-third cut in funding for enforcement under the EPA.

And the fact of the matter is, and this is a direct quote I heard in a speech delivered by a member of the Republican leadership, the EPA described, and I quote, "as an American gestapo."

Now we can debate whether or not that characterization is responsible but we can't deny it. And so there are differences of opinion when Members on this side of the aisle and the Administration discuss the reforms advocated by some on the other side of the aisle.

In fact, the question is whether or not they are indeed reforms.

Now my question has to do with brownfields. Although I have an interest in that issue that is parochially based, and that is I represent Bethlehem, Pennsylvania. Bethlehem Steel is located along the banks of the Lehigh River. We have about three miles of real estate that needs to be cleaned up as part of a brownfields effort.

That parochial interest on my part also has nationwide implications. There are many other older industrial sites that cry out for a similar cleanup and reuse so that we can preserve the remaining prime farmland that often surrounds these industrial areas.

I am eager to clean up that property in my district and eager to have federal law that provides an incentive for such a cleanup nationwide.

My question is for Mr. Gardiner, although I invite the other members of the panel as well to comment.

Mr. Gardiner, could you describe for me what efforts EPA is making in the area of brownfields reclamation? I'm aware of the demonstration projects, for instance, that EPA has advocated.

Congressman Jack Quinn, a fine member of the Congress, Republican member from New York, and I have cosponsored legislation that would reflect performance-based standards and the certification of state programs, such as the one we have in Pennsylvania, to encourage the cleanup of older industrial sites.

I'd be interested in your thoughts as to that conceptual approach.

And then secondly, how are we doing in terms of the development of emerging technology, specifically focused on the challenges of cleaning up older industrial sites and then reusing those sites for viable commercial purposes?

Mr. GARDINER. Congressman McHale, let me just say that I think we share very much your interest in dealing with the Brownfields issue in a comprehensive way in the manner that you're suggesting.

As you indicate, we have a series of demonstration programs that we're financing around the country in which we are giving grants to local communities who are moving ahead to tackle these communities that are contaminated and could be put back into economic production.

And we think this program, which we have funded I think on the order of 50—I'm not sure of the precise number—of demonstration programs around the country, is one of the most common sense and cost effective things that we have been doing.

Furthermore, the President has proposed in the FY97 budget, an additional tax credit. I think it's $2 billion over the course of a seven-year period, that would be used to help the private sector finance cleanups at these brownfield sites.

And we believe that the credit will not only go a long way in the direction of promoting the cleanup of these sites but also in promoting the development of technologies that would be used to clean up those sites that are already out there today, but clearly there are hundreds and perhaps thousands of other sites around the country that could potentially be cleaned up as well.

In terms of your legislation, obviously we'd be anxious to take a look at it and to attempt to work with you and Congressman Quinn to try to see if there's something that we can agree on.

Mr. MCHALE. Thank you. We'll take you up on that. Just as a legislative agenda, concept of operations, would you see us moving forward in the area of brownfields reclamation with independent legislation, or would EPA be inclined to incorporate it into a comprehensive CRCLA reauthorization, or RCRA amendment?

Have you given any thought to that?

Where does this issue belong in terms of the statutory scheme?

Mr. GARDINER. Well my impression is that there are some things that we can do that are probably free-standing. For example, the tax credit is something which would be a change in the tax code which I suppose it could be done as a part of a more comprehensive bill, but there's not necessarily any reason to do so.

I think we've been open in terms of considering amendments to either the Superfund legislation or to the Resource Conservation Recovery Act, and again would be willing to work with you or with others to try to see if there's something we could do in that area.

Mr. MCHALE. Any other comments?

Ms. POWER. Yes, sir. I think voluntary cleanup, which is what brownfields is a part of, is one of the most vibrant and exciting markets in the country. It's a win/win for the environment and the economy, one of the few areas where that can happen.

I've seen cleanups in the Illinois State Program that bootstrapped $1.6 billion worth of economic leverage from the environmental cleanup to the construction that was created to the raising of the tax base by cleaning up the property, and the jobs that were created thereafter. It's a wonderful multiplier effect.

In 1992 alone, American Banking Association Task Force worked on $5.4 billion worth of secured financial transactions in a very constrained market, so the potential there of these 500,000 sites that need some form of cleanup is a tremendous, it's a double-edged sword. We've got a problem now, but it creates economic op-

portunity and environmental approvement, and also opportunities for innovative technologies.

I'd like to point out one thing that's happening on the regulatory side right now. The EPA's proposed hazardous waste identification rule for contaminated media is seeking to, and in some cases is very successful in lifting some of the horrible impediments that have sought greenfields.

RCRA permits sometimes took three to five years, and cost over $5 million. RCRA technical standards set for organics virtually drove mandatory incineration. Those are now being looked at in a different fashion that will open up the way for other innovative technologies to come in and clean up these sites in a more cost-effective manner.

But one caveat I'd like to mention to both Committees is that the treatment requirements, if you look on a compound-specific basis, there some treatment of these compounds will be non-existent.

And I find that in this overall package of reform, which is good for brownfields, good for innovative technology to have this one huge category of multiple contaminants at sites that require no treatment at all is not good for the economy, not good for the environment, and not good for innovative technology.

Mr. MCHALE. Thank you very much. I share both your conclusions and your enthusiasm. It's an important issue. Brownfield reclamation is an important issue, not only from an environmental standpoint—something that's important to me—but also if we are to preserve greenfields and provide for economic growth on properties that have been used in the past, and in my view, should be reused in the future.

Thank you, Madam Chair.

Mrs. MORELLA. Thank you, Mr. McHale.

Before Mr. Gardiner leaves, and I know he has to momentarily, I thought I would give Mr. Carroll and Mr. Urh an opportunity if you want to respond to anything that he has said before he leaves, and then we'll get on to Mr. Ehlers.

Mr. Urh?

Mr. URH. I'd like to speak to the question that was posed earlier by Mr. Rohrabacher about what kind, is there a specific example of legislation that may be of assistance here.

I can give an example, talking about methods approval and the process that we have to go through to get a method through, there are several programs within EPA, and I'm probably going to butcher the names of them, but the Superfund, the Hazardous Waste and Soil Testing Methods that have to be written, Drinking Water, and the Ambient Water methods that have to be produced.

When we develop a technology and write a method, and take it to EPA, we have to go to each of those departments. Each of those departments has a different and unpredictable method for getting—I hate to call it even a system, because it's more a matter of talking to the right chemist or talking to the right administrator within the department within each office of the EPA, to get that method through.

And as far as does EPA have authority now to change the way methods are produced and approved? Our reading of the law is it looks like they do have authority to do that.

But we've been seeing, on the record, EPA has recognized method development as a problem for the past ten years, and as near as we can tell, there's been no change in the way we get a method through the system.

It requires a tremendous amount of effort to get through one office. To get through all four is several years of work and a significant amount of effort on our part, just to get the method approved.

Mrs. MORELLA. I think that's a big problem that we're hearing.

Mr. Carroll?

Mr. CARROLL. Thank you very much.

I wanted to speak to the permitting for air sightings. Although I think that the technology demonstration programs that were spoken to this morning, particularly the XL program hold considerable promise.

The reality of the situation is that application permits today in the field by our customers are put through an extensive and very costly review process.

And it is that aspect of the Clean Air Act that I was attempting to focus on.

Looking for specific emissions standards so that people who want to buy a piece of equipment and install it can do so with a high degree of certainty that they will be able to obtain a permit for that piece of equipment.

And people that develop that technology for sale and invest in the skills and the R&D activities to achieve goals that they can take to market.

And that's not in the system as we see it today.

Could you monitor back to achieve that? I believe you can without necessarily legislation. I think it could be done administratively, possibly through a presumptive approach to it, in other words determining ahead.

We see it in other industries where the EPA has come to an agreement on specific standards over time.

I believe and would argue that if we can work toward those specific goals, we could have very high quality emissions, clean air in the United States, and we could accomplish this with a more streamlined process that would allow, or require, I should say, fewer people to accomplish that, and it could be done for less money.

The question I think that would be fair to ask is, when do we finish regulating given technologies? When do we get them to a level of emissions that we're satisfied we've accomplished what we want to so we can move on to something else, or is this an ever growing industry that will never stop increasing in its scope?

Thank you very much.

Mrs. MORELLA. Thank you.

Ms. Power, I'll give you a very brief opportunity.

Ms. POWER. Thank you.

I just wanted to clarify. I don't think I said that standards should not be made more flexible under Superfund. What I did say is that national goals and national standards are very important but we have to have the flexibility to recognize when they don't work at certain untractable sites.

And I'd also like to point out that although we've done twelve soil washing projects under Superfund, the point that I was making is that that equipment and that proprietary approach is now owned by Dutch interests, not United States interests.

Mrs. MORELLA. Mr. Gardiner, I know you have to leave. I don't know whether you want to respond to them.

What I'd also like to ask you, if you would like to have somebody be your surrogate from EPA who'd like to be here sitting at the table, and if that person, you know, chooses not to answer questions, you know, could get the questions to you and then back to us.

It seems almost kind of unfair to say happy plane ride when we have three people who are making suggestions.

Mr. GARDINER. Let me do this.

The fellow sitting right behind me is Walt Kovalick, who is the Chairman of EPA's Innovative Technology Council, which is the group that we've established within the Environmental Protection Agency to promote environmental technologies, and so I think he'd be the appropriate person, and he expressed some willingness to come and assume my seat, so let's do that.

Let me just say that my impression is that, in terms of your question to the witnesses about legislation and whether that's absolutely necessary, again, I would reiterate that I think we have to be careful to look at each individual case and not take a sweeping approach—is legislation necessary or not.

It's really—is this kind of legislation necessary or not.

I would argue, as I think, to a certain extent, the witnesses have said themselves, we have the authority to fix the monitoring problem under existing statutory authority, and we're moving in that direction.

I think we have the authority to deal with the problems that Ms. Power indicates and we're moving in that direction.

I think we have substantial authority under the Clean Air Act to deal with at least some of the problems that Mr. Carroll has indicated, perhaps not all.

We've established efforts like Project XL to invite people from the private sector who have suggestions about different approaches that may challenge us to push the edges of the legal envelope, to come in and to try to work with us to do that.

I think we've established a good track record.

I certainly would reiterate that our view is that the most important legislative action that you could take to promote environmental technologies is to fund the Environmental Technology Initiative at the level that the President has requested.

I think that's the resources we've been using since the Clinton Administration began to help drive the kinds of changes that I think we all support and to try to promote the interests of the environmental technology industry, not only here at home, but in that rapidly-expanding global marketplace that we all want to compete and win in.

Mrs. MORELLA. We'll probably pick up on the ETI with Mr. Kovalick, but I wanted you to know that I am a supporter of EPA, and Members of these two Subcommittees are, and what this is about is to see what we can do to ensure that there is coordination

and that we can move ahead to promote environmental technologies without the impediment of regulations that have not been changed or adjusted.

And I very much appreciate you being here.

Mr. GARDINER. Thank you. I apologize that I have to leave. I think it's tremendous that you've got a forum that's going and it's a terrible thing to have to go away from it.

But I'd be more than happy to work with you and the other Members who've been here. I think that environmental technology is one of the most exciting things we've got going. And we'd like to work with all of you to try to help move forward on that.

Thank you very much.

Mrs. MORELLA. Thank you, Mr. Gardiner.

I'm going to ask our new EPA witness to restate his name and come forward.

Kovalick, how do you spell it?

Mr. KOVALICK. Thank you, Madam Chairman.

My name is Walter Kovalick. It's K-O-V-A-L-I-C-K. And my position is as the Director of the Technology Innovation Office in our Waste Programs part of EPA, the Office of Solid Waste Emergency Response.

And one of my part-time duties is to co-chair the Innovative Technology Council that Mr. Gardiner mentioned which tries to coordinate across EPA our innovative technology efforts, as well as help him administer the Environmental Technology Initiative.

So I'll try and help all I can.

Mrs. MORELLA. Thank you, Mr. Kovalick.

I wanted to now in all fairness defer to Mr. Ehlers who has been patiently waiting to ask questions or make statements.

Mr. EHLERS. Thank you, Madam Chair, and I will try to be fairly brief because the hearing has been dragging on, and I also have an appointment that I'm late for.

I had decided not to ask any questions of Mr. Gardiner. I felt he had been raked over the coals enough, but now that we have a fresh victim——

[Laughter.]

Mr. EHLERS. It's very tempting to start over again. But I won't do that.

I just have a few questions for the panelists.

Before I do that, let me go on record as favoring totally what we're trying to do here, and that is to advance innovative technologies and to permit them as rapidly as possible.

And I have a lot of experience at the state and local levels, having served as a county commissioner for eight years, a state legislator, both House and Senate, for eleven years, and being the chair of the committee that dealt with Michigan Superfund Law and the sponsor of that bill.

And we did take care of a lot of these things and things are going much better in Michigan now and much faster.

I'm very disappointed it appears we will not get Superfund through this year.

I'm disappointed Mr. McHale left because I think his brownfields program should be part of Superfund and we should all work very hard to get that out this year.

Very simple question, Mr. Carroll, just out of curiosity. Your company is called Solar Turbines, but you talked only about gas-powered. What's the origin of the name, and do you in fact produce solar turbines?

Mr. CARROLL. We do not make solar powered turbines. The origin of the name is we were originally the Solar Aircraft Company and built the metal airplanes. Our plant is, the people that began the company leased the building after Ryan's plane. Lindbergh's plane was built by Ryan, and we have operated there for 60 some years.

And we have about 4,000 people all in the aircraft industry that manufacture our equipment in San Diego.

I'd also like to add, however, that we have 6,000 subcontract companies throughout the United States, and last year we distributed amongst those small businesses, $480 million in subcontracts. And we export about 80 percent of the product that we make in the United States.

Mr. EHLERS. Thank you. And I suspect you stopped making solar airplanes when you found the wings melted when you got too close to the sun?

Mr. CARROLL. That's right. The first airplane was not called—but we made three airplanes, and the Depression brought an end to that industry, and we moved into the manifold, aircraft manifolds. And Rohr began his business flush riveting at Solar and then moved onto the Rohr Aircraft Company.

Mr. EHLERS. Ms. Power, I think you're the best one to answer the following.

I'm interested in what is happening in the field. What are the new and innovative technologies? You've mentioned some of them. You mentioned the little luminescent bacteria.

I couldn't help but thinking it would be nice if we had a number of luminescent Congressmen in the House as well.

But what beyond that?

What's happening in the field?

What are the latest and newest innovative technologies that we should be anticipating coming down the pike in the future and that we should think about as we're legislating and making provision for rapid approval of these?

Ms. POWER. I think bioremediation is one of the most exciting fields, and there are broader and broader applications for bioremediation as new and different constituents are taken on.

And if you are looking at a remedial site, you've got to remember that there are big difficulties with the fact that the contaminants are ordinarily deep in the ground and different types of matrices, clay, soil, loam, dirt and a witch's brew of different materials. Biological treatment is getting better and better and being sent below subsurface and with addition of oxygen, pampering the bugs, as it were, so there's a tremendous increase in the efficiency of those to in fact remove the constituents.

Another area that we're seeing right now that's just now being experimented on are microbial fences. So instead of the old traditional concrete slurry walls and cap and contained type remedies that we've seen and they've also had catastrophic failures, I might add, you might remember this, the Butler Tunnel is a prime example of a catastrophic failure of a cap and contain remedy, we're now

finding that microbial fences can provide a barrier for the moving of groundwater plumes.

Soil vapor extraction is becoming more and more effective and it's very cost effective.

And then I'm going to throw the ball over and with a pat on the back to Dr. Kovalick, because I think that his program under the Superfund program has been one of the biggest successes at EPA in incorporating innovative technology into the field projects.

And I'm sure he's got some ideas that he can add as well.

Mr. KOVALICK. Thank you, and Ms. Power, I would just add that the watchword that I've been observing lately on new technologies has a parallel in the real estate business where we talk about location, location, location.

In the remediation business for groundwater it seems to be in situ, in situ, in situ, which means we've seen a great deal of activity related to new kinds of processes being conducted underground without excavation, without moving the soil.

And so that changes the way we think about regulation, because we're not going to be affecting citizens. Transportation is not required, and so processes, as she mentioned putting up a barrier wall, whether it's out of biological material or a very interesting one is using iron filings, simple iron filings to treat solvents like TCE and PCE common solvents, surfactants in the groundwater, for example, soap-like materials that help free up the compounds.

So I guess from a regulatory point of view, the most interesting developments seem to be how are we going to deal with new ideas that in fact are going to take place below ground.

And the last one is phytoremediation, the use of plants to actually fixate the inorganic materials in their roots, interestingly enough, or that actually transpire through the plants and treat some of these contaminants in ground water is what I'm talking about.

So that to me is a very interesting and exciting area that may require us to rethink regulation because there are no bulldozers, there's no movement of dirt, it's all going on in the ground.

Mr. EHLERS. Well, thank you very much. I totally agree with you that that's the direction, I think you have to be bold, both in development technologies, but particularly bold and venturesome, perhaps risk-oriented in adopting them and trying them and not be totally concerned that you may make some mistakes in some sites and won't quite meet the standards.

Thank you very much. I appreciate your comments.

Mrs. MORELLA. Thank you, Mr. Ehlers.

I'd like now to recognize Mr. Olver?

Mr. OLVER. Thank you, Madam Chairwoman.

I was going to go on an entirely different thing, but now you've wet my interest a little bit with the comments about bioremediation, which certainly phytoremediation is similar.

There is a theory that the earth is going to heal itself. And would it be a fair characterization for a lay person to think of this as the bioremediation being something that kind of enhances natural processes or mobilizes or concentrates what we may do research on and find would have happened over a much longer period of time to speed up those processes for remediation?

I don't want this to take long, I'm just wondering if that's a reasonable way to think of bioremediation?

Ms. POWER. I think there are certain cases where natural attenuation is effective, but that it is a small category of sites, given the broad spectrum of those that we have to clean up in the country. Bioremediation can be used at those other sites, but by means of natural attenuation, it would not be effective for some of the high concentrations, and as I said, witches' brews of materials that are there.

Mr. OLVER. Let me follow a different thing.

We have here EPA and then we have three people who I think would have to be characterized as innovative environmental technology developers. Is that fair enough?

Could you give me the relative importance of the Federal agency EPA versus the various states on the question of where permitting occurs?

It seems to me, my understanding has been that most of these permits are for the use of new technologies occurs at the state levels.

And I'm wondering whether that means that each of you has to have some technology that you believe is going to do a great job that you've got to sell it in every one of the 50 states, or whether you, what is the relative position of the federal government versus the state permitting processes in getting an innovative technology in usage?

Mr. URH. I'd like to speak to that first.

We have, our experience is that the Washington office of EPA generates methods or guidance to the people that are trying to run the labs out in the field.

And the interpretation of what a laboratory can do varies with each state and within each EPA region.

Our experience is that Region 9 is particularly easy, which is California, Oregon, Washington. Region 10's a lot tougher to get into. Region 9 is much easier as far as new technology. Region 2 is darn near impossible.

Mr. OLVER. So are you suggesting that you take a technology and you try to get the EPA to promote it, and then it goes to the states for permitting?

I'm looking for a relative measure of do you spend a third of your effort with EPA and two-thirds of it then trying to go and sell it to each of the states, or is it 90 percent, or only 10 percent.

What is it?

Mr. URH. The process is something like you get a method written, get it promulgated. There's a couple of years doing that and then, after that, you go to your customers who would be the laboratories who would actually use your product and it falls on them to go to their auditor, wherever they're going to be permitted, whatever state it is, and in some states they have very active auditing functions, in other states, they'll just turn to the local region and take the local EPA region recommendations.

It varies state to state and we have put efforts together where we have a person call each administrator in every state and ask them, so, can we use this technology? And try and find out, so that our customers will know.

Mr. OLVER. Well, I'm not sure maybe we're passing in the night here.

I thought my question was one that could be answered in relative terms, almost in quantitative relative terms.

Let me tell you where I was headed then.

I wanted then to follow up with a question because eventually my time will disappear here very quickly. I never seem to ask questions that anybody can answer very simply.

And the next part of the question, to get those of you who are in the field of developing innovative technologies, was to ask what you think is the capacity of the different states to do the testing and the verification and the work that is necessary, that I think must be necessary for them to then give you the permits that ultimately are given by the states, rather than by the EPA, for an innovative technology for use in the field?

Mr. CARROLL. Let me try to answer that. All permits go to the state. You submit your application to the state. I think now all of the states have permitting authority. Those permits are subject to the review of the EPA regional authority over some period of time.

So although the state has the authority, they do it with an understanding that the EPA is looking over their shoulders so they need some overall——

Mr. OLVER. Continuous back and forth communication between EPA and the state agency?

Mr. CARROLL. I'm sure there is. I'm sure there is.

So that's where your permit goes.

Each state may well have different standards, some for very good reasons. California and the south coast area has very rigid air quality standards for reasons that are very different than the air quality standards that you might find on the east coast here, and the southern part of the east coast. New England has its own special problems.

So in the permit process, we would spend 75 percent of our time dealing with state authorities in the permitting process. If questions come up and if the region wants to get involved, we would then go to them.

If we are concerned about policy or regulatory issues, we would spend 75 to 80 percent of our time with the Federal EPA.

Mr. OLVER. I see, and what do you, what do you—the second part of that, what do you find is the capacity of the state agencies that are doing this one by one in different ways with the different EPA—I'm surprised that the different EPA regions have substantially different basic policies but that's interesting to know.

What do you find is their capacities to do the science and the verification to determine whether this is an appropriate technology and going to produce what it claims for effectiveness and things of that sort?

Mr. CARROLL. I think that the process that we now have is difficult for new technologies to come into the market. And that's partly because you're never really sure, as a regulator, if the permit that you're going to give will stand the test of not only perhaps federal review, but also environmental communities or anti-environmental communities, and there's a whole cast of lawyers circling outside there to step into this process.

And so it is subject to a number of review cycles, and that unfortunately significantly delays the process.

Mr. OLVER. Well, I would like to sort of repeat what my colleague from Michigan said earlier. I mean I think that we are all in this business to promote the development of innovative technologies and see them get into usages, and therefore must streamline a process which you've, in the two answers, I'm beginning to understand is a bit arcane and a bit complicated, and a bit subject to idiosyncracies.

Yes?

Ms. POWER. Mr. Olver, I'd also like to point out, as opposed to permits, there are also major grant programs which allow the states to generically take over and take the money to administer whatever program, be it permit or compliance or whatever.

And as far as innovative technologies go, very few states will try to push for an innovative technology if EPA is not willing to accept it.

And this California-based innovative technology I mentioned earlier in my testimony, there are over 12 states that want to use this technology, but EPA has not deemed it equivalent, and so despite the states wanting to use it, until EPA will agree to it, they don't feel like they can incorporate it into their programs.

Mr. OLVER. Now we can hear from EPA.

Mrs. MORELLA. The gentleman's time—well, if you could do it briefly, just so I can get on to others who are dying to ask questions.

Mr. OLVER. I just wanted to clarify that I thought we have two different perspectives here, Congresswoman. One is Mr. Urh, who is not needing a permit to try and get his technology, and he was discussing regulations that we write at the federal level and equivalent methods.

Mr. Carroll is discussing getting a permit through the state agency and delegate it, so we have two different kinds of technology. One doesn't require permitting but is controlled by these regs. And the other is done at the state level where the permits are issued.

And once the regulations are written, EPA is generally delegating the programs to the states.

We've got two contrasting kinds of technology developers here.

Mr. KOVALICK. I believe I'd agree with that, yes.

Mrs. MORELLA. Very, very informative questioning and responses.

Mr. Wamp?

Mr. WAMP. Thank you, Madam Chairwoman.

I too want to commend Congressmen McHale and Quinn for their brownfield initiative and express my regret that we may not get to Superfund in the 104th Congress and hope that we can get at least to a slimmed-down brownfield bill so that we can move these processes forward.

Mr. Kovalick, thank you for having the courage to step up.

I want to share a quick story with you so to set the stage for my line of questioning here.

A major Superfund cite in Chattanooga, Tennessee, called Chattanooga Creek Tennessee Product Site. For about ten years, we fought to try to add this site to the NPL listing.

Last October 1st, after much pressure from my office and other areas, Carol Browner thankfully added this site to the NPL listing.

Interestingly enough, that after it took that long to become an NPL site, when the major PRP, there are several, but the major one was the Department of Defense, making ammunition in World War II, polluted a mile and a half of our creek bank in Chattanooga, Tennessee. It's really a bad situation with coal tar on both banks of Chattanooga Creek, very much contaminated the entire area.

But now, just a few months after we were finally listed, we are second in the nation on removal action in the priorities that EPA has set, based on health and safety risk and the five criteria that they use to determine which sites qualify for removal action funding.

So obviously we should have been added a long time ago. I'm just grateful that we are.

And as we move into what's—right now, we're in the middle of the public comment phase, before we go into the three-to-six-month removal phase, and many of our local community businesses, environmental technology enterprises, which we have many in that part of Tennessee, are wanting to participate in the cleanup and to use their environmental technologies.

Thermal desorption, baking the dirt, quite a few water technologies, including biotechnology that we just discussed, are not only available to us, but they are homegrown, East Tennessee-based technologies, industries where we have those technologies.

I would suggest to the EPA to combine a victim rights, I'll use some other initiatives that ought to be combined into an approach on environmental technology, how to clean up these Superfund sites, to me it's a good cross between victims' rights, because the people in these Superfund communities have been victims.

Their buildings are boarded up, the industry has left, unemployment is high, they qualify for enterprise zones, for empowerment zones, whatever legislation you can find, affirmative action. That's a good affirmative action program to put some of these inner city residents back to work.

Environmental justice is a term that I had not heard much until recently. That's environmental justice. Use those technologies, make it a model nationwide, please. And I'd like for Mr. Kovalick to comment on this, where the EPA would say if there is a technology in that region that can be implemented to employ the very people that live in the area, to remove, to clean up, to purify, to use those technologies so that they can experience environmental justice, maybe some job creation because they're the ones that lost the jobs in those very areas.

Our citizens are coming out through my office and asking EPA for a 30-day extension on the public comment period to say, can we please go to work to clean up these sites? Can you please use our local businesses to clean up the sites?

Frankly, we've got the technology, but yet the Army Corps of Engineers' traditional measures are to go somewhere else and bring

somebody else in, and then they benefit, and we don't even receive the local benefit on a major Superfund cleanup site, which may be $50 million when it's all said and done.

It's an important thing, and I think as we look at reforms and efficiencies, we really need to try to localize the cleanup initiative to create as many jobs for the very people that were adversely affected over generations.

And I'd like for you to comment on that.

And I would like to commend you, as well, for doing what you're doing. I think this is a great opportunity for us to do the right thing and create a few jobs.

Coalitions are coming together between Republicans and Democrats, and I appreciate Mr. McHale's comments and the leadership of the Ranking Member of the Technology Subcommittee, Mr. Tanner from Tennessee. There's a lot that we need to do together on this.

Mr. Kovalick?

Mr. KOVALICK. Thank you, Congressman.

Obviously you are intimate with this site, and it's in your district, so I always defer to both our regions and the local officials who know so much more about sites.

All I can say is I think you have a very positive point where you're trying to link these needs to clean and the people who offer those services.

I would guess, just from what you've said, that this is being a federal facility or a federal lead site, you're saying the Corps of Engineers is involved, that they're also going to be governed by other objectives we have.

For example, competitive bidding. While you may have some very dynamic and—I don't know these firms so I'm just speaking as a general rule here—they're going to have to be governed by looking across who offers bids on the kinds of solutions that the parties involved are going to be looking at in their feasibility studies.

So while you mentioned one objective, which is to involve companies who have technologies in that area, that'll be left in the hands of how the bids work out. That's one view on the technologies.

And then once the selection is made, of course there are going to be people employed to clean up the site, and there are all levels of activities. Some drilling wells or normal earth moving and transportation no doubt will be contracted in that area. That would be a logical choice.

And then the question is, depending on the technology that's chosen, you mentioned thermal desorption or whatever, that may or may not turn out to be from your area.

And so I guess I want to say that I understand and appreciate your point and why that would make sense to have all of those interests merge, but they're just guessing that there are going to be some other factors like competitive bid processes that we all want observed to get the most cost-effective cleanup for the federal dollar.

Mr. WAMP. I heard the beep, but I'd like to hear Ms. Power if she wants to comment.

Ms. POWER. Yes, I do, Mr. Wamp. I think that once the competitive bid process has taken place, and private contractors are in

place at these sites, I can at least speak of OHM Corporation where I was regulatory vice president for ten years. They've done over 30,000 cleanups in their 25-year history, and it was a very high priority and was good business in that any site that took a year or more to clean up, there was not only very heavy local hiring, but training of people who did not have skills to work on hazardous waste sites.

They found it a very, very effective way to get good workers, and they've seen repeat people come back into and onto jobs over and over again that were trained 20, 25 years ago, because of this first effort to get them trained and get involved in the industry.

So that does happen and it happens very frequently.

Mr. WAMP. Thank you.

I think one point, Mr. Kovalick, if the local companies have an opportunity to bid, that's what we're talking about. And frankly, many of them don't know how to go about finding out how to bid on some of these projects, especially at the magnitude at which this Superfund site, it's more of a national competition, and a lot of these local companies, they really don't have the experience.

So if you can come in with an EPA effort to try to permeate the community with a full notice, and that's what I think this extension is about in Chattanooga, to try to get the notice out there to these local companies.

Thank you, Madam Chairman, for your indulgence.

Mrs. MORELLA. Thank you, Mr. Wamp.

I now recognize Mr. Barcia who's been patiently waiting to ask his questions.

Mr. BARCIA. Thank you very much, Madam Chairwoman.

In the interest of time, I know that the audience has been patient, as well as the Committee membership and yourself, Madam Chairwoman, I would like to submit, if I could, a list of questions and a statement regarding a landfill in my district that's a landfill located on the middle grounds, which is an island in the Saginaw River, has been identified I think as one of the worst, at least polluting sites in the Great Lakes region in the midwest.

And I know that my predecessor, Congressman Bob Traxler, worked for ten or twelve years on this issue, and finally was able to get funding and appropriations approved to do a test site, a test at the site using new technology that was pioneered by Ecologic, a Canadian firm, based in Ontario.

And in 1992, I believe that test was conducted. It was found to be effective to 99 point six nines, at remediating chlorinated biphenyls.

And in 1993, I believe, the Chicago office of the Environmental Protection Agency gave a resounding I think confirmation of the effectiveness of that technology in dealing with polychlorinated biphenyl contaminated soils, and that has been forwarded to Washington, and I think pending here for some three years.

Unfortunately we also, like Mr. Wamp, our local community for many years have been pushing for that site to be on the NPL list, and unfortunately now with the language that was adopted by the Congress and signed by the President in the rescissions bill that we passed over a year ago, now the Governor has to sign off on that.

And Governor Engler decided, in consultation with our local officials who are now concerned about their financial liability in cleaning up the site, they decided not to encourage the Governor to include it on the National Priority List.

So we're, the estimated cost of the site cleanup is $100 million. The estimated cost of the cleanup using the new technology would be one-fifth of that cost, or approximately $20 million.

If there's anything you could do, Mr. Kovalick, to help speed the process and the permitting process along of this new technology that would be very helpful to us in Michigan, particularly in the Fifth District, at cleaning up this site, we would be most appreciative.

And I won't take much more time. I didn't even intend to go this long. I would like to, Madam Chairwoman, if I could, submit a statement and a few questions for the record.

Thank you very much.

Mrs. MORELLA. Mr. Barcia, hearing no objection, the materials that you have mentioned will be included in the record, and all members will have an opportunity to pose questions to you, since you seem amenable to it, for your responses.

Thank you, Mr. Barcia.

I'd now like to recognize the Ranking Member of the Technology Subcommittee, Mr. Tanner.

Mr. TANNER. Thank you, Madam Chairwoman. And I, in the interest of time, would ask unanimous consent to submit a statement and also some questions for the panel.

We appreciate your being here.

Mrs. MORELLA. Without objection, so ordered.

[The prepared statement of Mr. Tanner follows:]

STATEMENT OF HONORABLE JOHN S. TANNER

ENVIRONMENTAL REGULATION: A BARRIER TO THE USE OF ENVIRONMENTAL TECHNOLOGY

SUBCOMMITTEE ON TECHNOLOGY

COMMITTEE ON SCIENCE

20 JUNE 1996

Good Morning, and I want to welcome everyone to this hearing.

I have long been a proponent of the need to overhaul our outdated environmental laws and regulations. Clearly, the nation's environmental policy needs to be revised; the problems are too many and the public resources are too limited to continue in the current mode. However, the solution is not to hobble regulators with inflexible analytical and legal requirements which would serve only to delay the introduction of improved technologies to solve environmental problems. Nor is the solution to simply weaken environmental protection standards.

We need to develop an environmental policy for the 21st century. Regulators and industry must be freed from an outdated end-of-pipe environmental policies and allowed to focus on developing the innovations that reduce environmental hazards as well as control the costs. The central tenet of a new environmental policy must be to promote technological change.

In addition, we must recognize that development of environmentally-friendly technologies are only beneficial if they are adopted by industry. Many small and medium-sized businesses don't have the in-house technical expertise to solve their environmental problems. This year the Tennessee Manufacturing Extension Partnership Center received a special NIST MEP grant to provide technical environmental services to small and medium-sized manufacturers which by all accounts has been ex-

traordinarily successful. Unfortunately, during House consideration of H.R. 3322, the Omnibus Civilian Science Act, an amendment was offered which eliminated this NIST program. I mention this only to highlight that there is a tendency to focus on technology development without following through to ensure it effective adoption and utilization.

It's time to move beyond discussion of the problems with existing environmental laws and regulations or the need for a new environmental policy. This doesn't move the process forward one iota. I believe that everyone here today would agree that technological change, both the development of new technologies and their diffusion, is the major engine of progress in our society today. What I hope to learn today is the specifics of how to harness and utilize technological innovation to ensure a clean environment for the future.

I want to thank the witnesses for appearing before the Subcommuttee today and look forward to their hearing testimony.

Mrs. MORELLA. Maybe I'll just have a chance just to ask a couple of very quick questions.

First of all, Mr. Kovalick, I have wondered about the ETI because it seems to me that it was in '95 that it started, and there was like $40 million for it?

Mr. KOVALICK. Ninety-four. In fiscal year '94, it was about $36 million.

Mrs. MORELLA. Can you tell us about any great accomplishments with that because I know now I think the request is for $80 million.

Mr. KOVALICK. Well, we've been at work. Of course the money was received in the mid-year 1994, and we awarded it to a variety of different kinds of projects, primarily, as Mr. Gardiner was suggesting, directed at changing regs and policy, enabling innovation through infrastructure changes.

I actually would use one example that speaks to the earlier discussion here. In a 1995 award, we were working with the National Governors Association and six states who are worried about the problem of mutual acceptance of environmental technologies, that is, this problem of going to one state capitol, proving that technology works, moving and then having to move iteratively to each state capitol.

These six state environmental commissioners have agreed that they want to share data and honor each others acceptances of those technologies.

And so with the National Governors Association and the commissioners, we are funding their efforts to try and conduct that data exchange for about twelve technologies, two per state, and see if they can then actually implement that goal.

So that's an illustration of tearing down a barrier that helps developers who approach one of the six states would be able to be accepted without another demonstration in another state.

Another, and examples fall in broad categories, like that, innovation capacity, helping capacity.

Another example of a project that's been quite successful is working with the State of Washington, the State of New York, and the National Recycling Coalitions Recycling Advisory Council on working with the Chicago Board of Trade to begin listing for electronic buying and selling, recovered materials.

The idea that we should be able, in the same way as hog bellies and orange juice futures, trade recycled materials. But of course one of the problems is, what is the material that we're actually

buying and selling so that all the buyers and all the sellers trust what is being traded.

So our project involves the actual testing and developing tests that the buyers and sellers trust for recycled plastic bottles, for example. How do you penetrate a bale of recycled bottles and say this has this quality.

So that's another example of ETI trying to help the market work out arrangements, but the barrier has to do with the trust among the buyers and sellers and the technological way in which you're going to, in that case, test the bale of plastic.

So those are examples of kinds of projects that ETI has been sponsoring.

Mrs. MORELLA. You know, I think the question is, is this not something that EPA should be doing anyway? Do they need ETI, and with a budget of $8 billion, it appears as though there could be better coordination and that could be done.

I just want to pose that because I think this is the kind of thing that from reading the testimony and listening to people, that I have heard.

Mr. KOVALICK. Although I would offer, in those two examples, it was the states and the others who needed the extra assistance to work together with us on that, but that's illustrative of the need to help others work through these technology issues.

Mrs. MORELLA. Well, you know, I wonder if I just might ask each of you if you could change a single regulation, or a law or part of one, to speed private sector development of environmental technologies, is there one that comes to mind?

Mr. Urh?

Mr. URH. The one that comes to mind absolutely first for our industry is for EPA to get out of the methods writing business and get into the goal-setting business as far as setting criteria that must be achieved for clean air, clean water.

Tell us what we have to measure, tell us how well we have to measure it, and then let us figure out how to do it.

Mrs. MORELLA. Let you work out how to do it.

Okay, very succinctly stated.

Ms. Power?

Ms. POWER. I think because I'm going to bootstrap off his, and his is one of my favorite, I get two out of this, and that would be to rely more on professional organizations that create standards and test methods and academia, where a tremendous amount of peer review has been conducted.

Mrs. MORELLA. So in other words, do some of the partnership coordination?

Ms. POWER. Yes. And then incorporate by reference. The RCRA program has wonderful provisions for incorporating by reference new ASTM methods. The Clean Water Act does not have an analogous provision.

So if that could be spread throughout the federal panoply, that would be very helpful.

Mrs. MORELLA. Very good point.

Mr. Carroll?

Mr. CARROLL. I don't know if a law needs to be changed, but I would at least look to a new interpretation of how we apply BACT

and LAER, so that we can select a particular goal or a mission standard and make the investment in technologies to achieve that.

I think that would also allow for accelerated permitting and a much more rapid integration of new technologies into the market that would have a very beneficial effect on the environment.

Mrs. MORELLA. I wonder if you would agree that the common theme that seems to run through this hearing today is that by increasing the use of performance-based standards, and therefore avoiding technology-based solutions, that we can improve and promote private sector development of environmental technologies?

You would agree?

And if you do, or even if you don't, are there instances where technology-based standards are preferable?

All of you just agree and you think no, right?

You want to try it, Mr. Carroll?

Mr. CARROLL. I think performance based standards are the way to go. I think that you take away the responsibility from the permit reviewer or the evaluator or the state regulatory agency, the problem of becoming a technical expert, and let him look at the solution to that problem, and that's a much easier thing to evaluate.

So I would try to stay away from technology-based and go to performance.

Mrs. MORELLA. Do you agree, Ms. Power?

Ms. POWER. Yes, I do, especially given the way that that would move away from the command and control type of regulatory system that I think has led to a lot of these problems.

Mrs. MORELLA. Mr. Urh?

Mr. URH. The question that Mr. Olver asked earlier about the burden on the states, as far as reviewing data, I think would be greatly reduced going to performance-based methods because they don't have to become experts on the technology in order to understand it, they can concentrate on the bottom line net result.

Mrs. MORELLA. Mr. Kovalick, would you like to have the final word?

Mr. KOVALICK. I would comment as Mr. Gardiner did in his testimony that the history of best demonstrated available technologies that appears in several sets of our legislation over the last 20 years, I think at the time they were passed, was comfort to many companies who said, I'll know exactly the way in which this should be done. I don't have to hire consultants. If you think about the problem of a small business with not a lot of compliance staff.

I think we've all gotten a lot smarter, and we at EPA and others have said, well perhaps BDAT-type regulations, which we have to write because of the history of some 20 years, we have a smarter way to do it now, like Project XL and otherwise.

At times, and perhaps some small businesses who have to comply might think that that's a little easier for them because of staffing issues. Not to be an advocate for that, but I think that could be the case.

Mrs. MORELLA. I wanted to thank the panelists for being here for such a long period of time, for the expert testimony that we have in writing, as well as your responses to questions and orally, and tell you we hope to continue through with this issue area to promote environmental technologies.

Thank you, Mr. Carroll.

Thank you, Ms. Power.

Thank you, Mr. Urh.

And I want you to know, Mr. Kovalick, you did a yeoman's job representing EPA.

We'll have to tell Mr. Gardiner that.

Thank you all very much.

[Whereupon, at 12:32 p.m., Thursday, June 20, 1996, the Subcommittees were adjourned.]

[The following material was received for the record:]

COMMITTEE ON SCIENCE
SUBCOMMITTEE ON TECHNOLOGY
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, D.C. 20515

Questions for David Gardiner, Assistant Administrator, Policy, Planning, and Evaluation.
U.S. Environmental Protection Agency

QUESTION: In your testimony, you indicated that you did not believe that there was a need for legislation to direct the Agency to move toward performance-based monitoring methods. Further, you indicated that the Agency is in agreement with the need to move to performance-based methods and is moving in that direction currently. Would you provide the Committee with a detailed written description of the Agency's plan to move from the current prescriptive analytical methods process to a performance-based monitoring method system? Please also provide the Committee with a complete timetable for implementation that includes specific actions that the Agency intends to take in the next twelve months.

ANSWER: My office has conducted a preliminary review of the statutes in order to identify the laws and regulations that may directly or indirectly prevent the use of environmental monitoring methods. At this time, we do not see statutory barriers to making further progress on a performance-based monitoring system - and I would further note that EPA's pesticide program has historically used performance-based monitoring methods with great success.

However, there may be other barriers to the use of performance-based monitoring systems, including resource constraints, which are currently assessing. If we identify legal and other barriers to implementing performance-based monitoring methods, we would be happy to discuss them with the Committee.

The Policy Council of the Environmental Monitoring Management

Committee (EMMC), which is formed by the Assistant Administrators (AA) took action concerning monitoring issues at their May 28, 1996 meeting. First, they decided to adopt and implement Performance Based Monitoring Methods Systems (PBMS). Next, the Policy Council ratified the goals established by the PMBS. The Performance Based Methods System Workgroup of EMMC is now preparing specific recommendations for implementation by all programs.

The EMMC's PBMS Work group will work with the various Program Offices and methods workgroups to help them develop implementation plans that are consistent with the stated goals of the PBMS, while continuing to meet individual program needs.

The PBMS Workgroup is now developing a schedule for the next 12 months for critical events in the development and implementation of the PBMS across Agency Programs. This timeline will be presented at an upcoming meeting of the EMMC Policy Council. The first item on that schedule is the completion, in review draft form, of this document to serve as an implementation guide to the programs in the development of their PBMS implementation plans. Next, the review draft will be widely circulated to generate stakeholder input. The stakeholder input will be included, where possible, in the final guidance document that will be forwarded to the EMMC's Policy Council to obtain Agency-wide approval and adoption.

QUESTION: We have received testimony that one of the problems associated with the current prescriptive analytical methods process is the diversity of requirements, processes, and even methods across the Agency's program offices. Would you provide the Committee with a description of how the Agency intends to ensure uniformity across all program offices for the new performance-based methods process? In addition, who in the Agency has the operational responsibility to ensure the implementation of new performance-based methods systems across all programs?

ANSWER: The Environmental Monitoring Management Council (EMMC) is the EPA entity directly responsible for the implementation of new performance-based methods systems. The EMMC was created by the Deputy Administrator in 1989, in part to provide a focal point for environmental-related issues. An EMMC work group representing the Program Offices, regions, and the Office and Research and Development (ORD) is working to define the common information elements required to document analytical performance in response to Agency monitoring requirements.

Through the EMMC, EPA is doing several things to ensure a uniformed, consistent performance-based methods process across the Agency including:

(a) developing a methods development tracking system. This system will be the central source of information on monitoring methods needs, methods under development, and contacts for information sharing;

(b) evaluating the creation of an alternative method approval system, which will allow a method applicable to more than one program to go through one Agency-wide, multi-program approval process;

(c) preparing a methods development framework, an activity that will allow the whole agency to review new monitoring method development efforts in order to prevent duplicative work;

(d) developing a consistent format for organizing and publishing methods to be used across the Agency;

(e) developing integrated methods, with various program offices working together to create common methods whenever possible; and

(f) in FY96, Congress appropriated funds for verification activities under ETI. Part of the FY96 proposed funding, under the Environmental technology Verification (ETV) program, addresses Compliance Assurance Monitoring Systems, and meets the

selection criteria under the ETV program. Focus in this area will provide the first standardized tests of continuous emission monitors. Not having proven monitors has been a major stumbling block to permitting all point source stacks believed capable of emitting toxics. Consequently, this will encourage regulatory reinvention and supports uniform, consistent performance-based methods.

The Environmental Technology Initiative (ETI) is also playing an important role in the Agency's move toward PBMS. First, to support a consistent performance-based methods approval process across the Agency, ETI funded two projects in FY94:

Project # 1: "Use of National Laboratories as Satellite Testing and Evaluation Centers in Support of the Consortium for Site Characterization Technology" aims at establishing a mechanism for verifying the performance of environmental monitoring and site characterization technologies. The EMMC developed a methods template used by the Consortium for Site Characterization Technology to verify technologies. The Consortium received additional funding from ETI in FY95.

Project # 2: "Demonstration/Evaluation of Innovative Monitoring Technologies" will develop test methods which can be used by sources to measure total process emissions with a single measurement downwind of the source. These monitoring techniques can be used to measure multiple pollutants with one instrument.

Next, individual EPA programs, in part with ETI support, have taken action to speed approval. With ETI funding from both FY94 and FY95, the Office of Solid Waste (OSW) has reduced the time required for a new method to be approved from over two years down to 14 months. The Office of Air and Radiation delegated the approval of an innovative monitoring method from the AA level to a Division level. This simple measure shortened the approval methods process by several weeks. The Office of Water (OW) is

consolidating its drinking water and waste water methods. OW is also streamlining its method approval process. OSW and OW are jointly developing oil and grease, and dioxin.

Finally, ETI has supported projects to speed adoption of specific alternative monitoring technologies. In FY94, ETI funded the "Monitoring Technologies Test-Off," focused on demonstrating innovative Department of Defense (DOD) technologies that address environmental monitoring problems. In FY95, ETI funded a demonstration project for innovative hazardous air pollutant monitoring technologies. The application of Fourier Transform Infrared Spectroscopy to environmental measurements has several advantages over traditional methods in that it has the capability of measuring over 100 of the 189 Hazardous Air Pollutants listed in Title III of the Clean Air Act Amendments of 1990, avoiding costly single-pollutant measuring techniques.

QUESTION: In the hearing on June 20, Mr. Oliver raised the issue of state involvement in the acceptance of various new environmental technologies. It is our understanding that the states also have a major role in the acceptance of environmental monitoring methods. Please tell us what actions the Agency contemplates to promote state acceptance of the Agency's move to a new performance-based monitoring methods system.

ANSWER: States already have an important role to play in the monitoring approval process. According to statute, each state shall, after reasonable notice and public hearings, adopt and submit to the Administrator an implementation plan that provides for procedures necessary to monitor data on ambient air quality. However, a preliminary analysis showed inadequate knowledge of the methods approval procedures and requirements in the states. In some cases, this causes states to ask for additional requirements to ensure proper compliance and "EPA blessing."

EPA recognizes state needs for training in the application of

approval methods, and in understanding laws and regulations. With sufficient resources for training activities, the Agency could set up a system aimed at improving the knowledge of appropriate procedures and appropriate technical matters for regional and state staff.

In addition, EPA is working to tailor the guidance for the PBMS to be consistent with the needs of the developing National Environmental Laboratory Accreditation Program (NELAP). This should help promote state acceptance of PBMS since NELAP has already determined that it will use a PBMS approach when implemented, and states participate actively in NELAP.

QUESTION: In your testimony you stated, "We'd like to be able to give some credit for Mr. Carroll's technology for the carbon dioxide emissions reductions that it achieves." Would the carbon dioxide emissions credits you advocate be based on future mandatory carbon dioxide emissions standards?

ANSWER: At this point, we do not envision future regulatory requirements. EPA is also persuaded by the recent Intergovernmental Panel in Climate Change (IPCC) and other evidence that the threat of global warming and associated climate change is real and serious. We also know that there are technologies available which can reduce greenhouse gas emissions and achieve other environmental and economic benefits. We are currently considering policies which would give air quality credit for voluntary actions which reduce greenhouse gas emissions.

However, we are not able to give credit for the direct greenhouse gas emission reduction benefits which Mr. Carroll's or other companies may deliver because there is no regulatory program against which to credit it. We are aware that many technology developers who have solutions to real environmental problems are frustrated by what they perceive as the slow pace of the government to recognize environmental problems or what their technologies may contribute to solving them.

QUESTION: How much does the federal government spend on toxic site remediation and cleanup including litigation and litigation support? What percent of the total is spent on actual clean-up activity, not including overhead, litigation, and litigation support?

ANSWER: The Agency obligated in fiscal year 1995 a total of $1,517 million to implement the Superfund program. These activities consist of all aspects of the program's efforts to remediate toxic sites, including response, enforcement (including litigation), management support, and research activities. The Agency formulates its budget and accounts for the distribution of funds by these major categories. A breakout of the Agency's Superfund 1995 obligations by category is as follows (including salaries and travel costs):

$1,162 million for the response program: provides funding for the cleanup of hazardous waste releases or potential releases from abandoned or uncontrolled hazardous waste sites, including emergency actions, site assessment, and long-term remedial responses. Includes funding for some other Federal agencies to carry out response-related responsibilities under CERCLA.

$163 million for the enforcement program: includes monitoring existing settlements for compliance and reaching fair settlements with small volume contributors; where negotiations fail to reach cleanup agreements, the Agency takes enforcement actions to compel responsible party cleanup. Includes funding for settlement and litigation costs for the Department of Justice.

$125 million for management and support services: provides essential services to the operation and integrity of the trust fund, including mandatory support costs associated with rent, utilities, security, and telecommunications costs and other administrative, financial, and legal services.

$54 million for research and development efforts; and

$13 million to the Inspector General for audit activities.

Please note that the figures presented above reflect the direct program only and do not include resources for other Federal agencies (such as Department of Defense and Department of Energy) to clean up sites for which they are responsible.

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