

Public/Private Partnership for Sustainable Use of Natural Resources Natural Resource Workshop

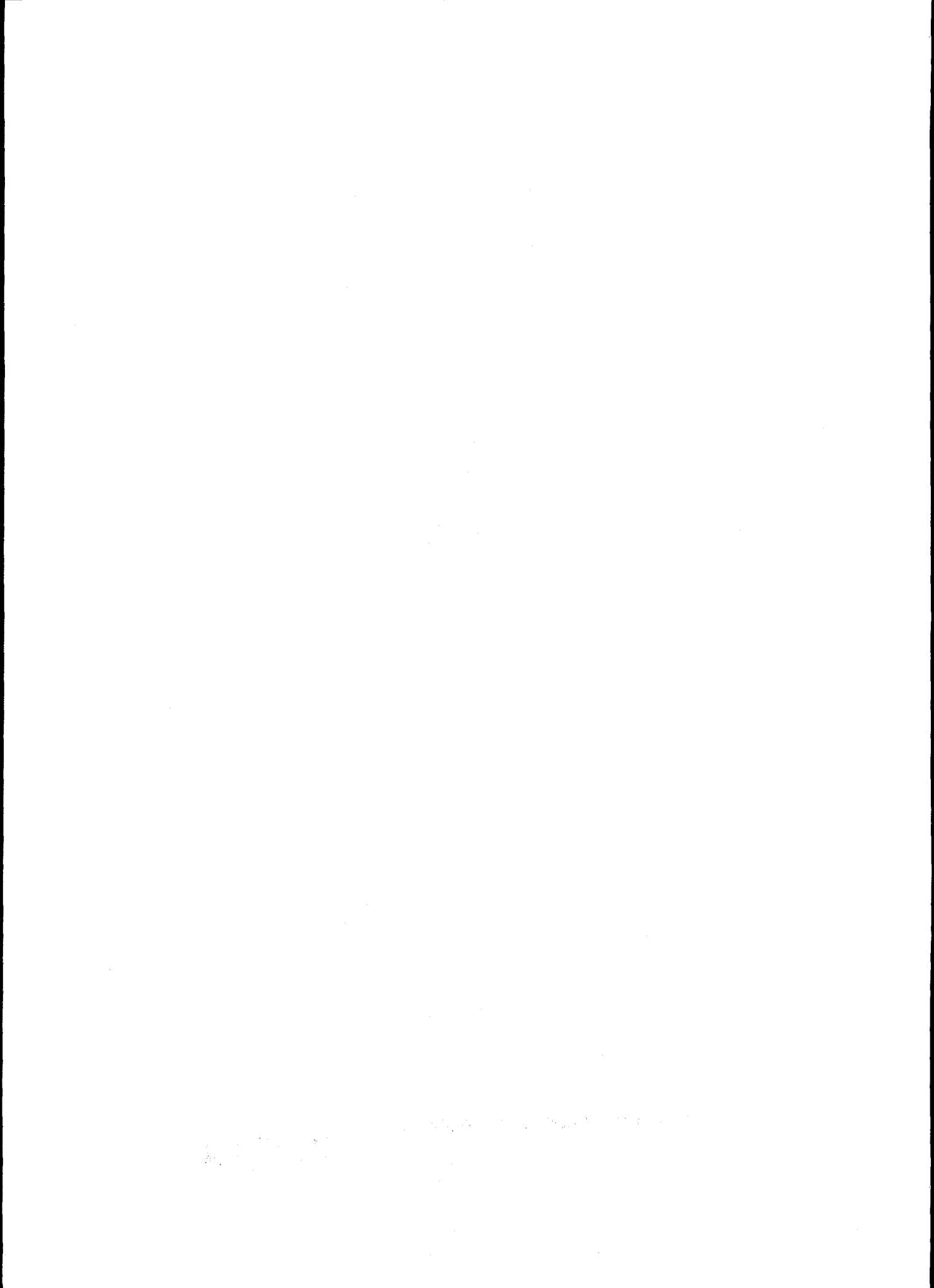
**February 1-2, 1995
Convention Center on the Grove
Boise, Idaho**

**Sponsored by
The White House, Office of Science and Technology Policy**

**Hosted by
U.S. Department of Energy, Idaho Operations Office
Idaho National Engineering Laboratory
Idaho Department of Commerce**

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Executive Summary

As part of an effort to shape Federal policy for environmentally sound, sustainable economic development, the White House Office of Science and Technology Policy sponsored a workshop in Boise, Idaho on February 1-2, 1995. The Boise Idaho workshop focused on the sustainable use of natural resources, a topic of considerable interest in Idaho. The workshop gave representatives from industry, academia, research, the public, and local and state government an opportunity to provide input to lawmakers and policymakers for establishing a National Environmental Technology Strategy to be issued by Earth Day, 1995. The workshop addressed such questions as:

- What obstacles are restricting the application of technologies for the sustainable use of natural resources?
- What tools are needed to encourage sustainability?
- What role should be adopted by industry, the public, government, and academia?

The workshop was hosted by the U.S. Department of Energy, Idaho Operations Office (DOE-ID), the Idaho National Engineering Laboratory, and the State of Idaho Department of Commerce. Participants in the workshop included industry and technical panelists, who addressed the issues of sustainable use of natural resources in six areas: agriculture, water, mining, forestry, energy, and the environment. In addition, six focus groups comprising representatives from industry, the public, universities, and government met to discuss and provide input on issues related to sustainability. The workshop also included general sessions that addressed material that cut across the six focus group areas.

The result of the workshop is this report. Together, the workshop and the report serve as a vehicle for discussing concerns at the grassroots level and conveying those concerns to lawmakers and policymakers in Washington, D.C.

There was a general consensus at the workshop that policies and regulations need to be changed to encourage (a) more flexibility and autonomy for businesses and local officials, (b) fuller consideration of economic impacts and economic sustainability, and (c) more positive and reliable incentives and financing for development and implementation of innovative technologies. The following is a list of the main points that surfaced during the speeches and discussions at the workshop. In some instances, people who attended the workshop specifically requested that their concerns be communicated to the White House. Such concerns are included in the list. The list is divided into five broad categories.

Regulations/Policy

- Regulations need to be goal-oriented instead of being prescriptive. They need to specify what needs to be done, not specify how it should be done. Government should support efforts by industries to meet environmental goals as effectively and cheaply as they can. The businesses themselves know best how to do that.
- Regulations need to be written with sustainable development in mind. We must find ways to increase the flexibility of our regulatory structure so that it functions to encourage greater innovation.

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- Industry needs incentives for compliance, not penalties. State and Federal governments should offer tax breaks and other incentives for renewable or innovative technologies that sustain/preserve resources or environment while offering a service to consumers.
- Industries can't plan or start new plants/businesses if it is likely that policies and laws will change during permitting, construction, or early operation. Policies and laws need to be stable; changes should not apply to developments that are already underway.
- Policy should be based on sound science and common sense, not hype and politics.
- We need local authority for decision making; under the current arrangement, too many decisions are made by people who have never "been on the ground."
- We need the flexibility to enforce regulations on an ad-hoc basis. Not all regulations fit all situations. Some regulations are expensive and pointless.
- Regulators themselves are immune to regulation, so they have no need or incentive to work out solutions. Policies should require regulators to be solution-oriented, not prosecution-oriented.
- Industry needs the freedom to change midstream if difficulties arise. Regulators should encourage the use of adaptive management to solve problems.
- There should be criminal and civil penalties sufficient to discourage the squandering of natural resources. Currently, penalties are often smaller than the economic gain to be had from abusing or depleting the resource.
- Government and industry should make the attempt to involve stakeholders early enough in the process that their input has value to them and to policymakers. Collaborative decisions are generally better decisions, and don't have to be sold to an unwilling public.
- For some industries, particularly paper mills, it is simply impossible to get a permit to build and operate a new plant in the U.S. All new plants are being built overseas.
- For other industries, particularly mining, it takes much too long to get a permit, typically four years. One year would be more appropriate.
- Laws and policies need to be changed to allow the Forest Service and the Bureau of Land Management to manage forests sustainably.
- The NIMBY ("Not in my back yard!") syndrome sometimes inappropriately interferes with development of resources and implementation of new technologies.

Ecology/Economy

- We cannot have economy without ecology. Abuse or depletion of natural resources has the effect of impoverishing a region or a nation. Conversely, we cannot have ecology without a strong economy. Impoverished people are too concerned about day-to-day survival to devote any effort to protecting natural resources.
- We need to understand that maintaining and enhancing our environment is not and should not be in conflict with economic development. In order for a practice to be truly sustainable, it must be both ecologically sustainable and economically sustainable.
- There was significant consensus among attendees representing the mining industry that the approach taken by the National Science and Technology Council (NSTC) appears to address the environment to the exclusion of the industry's competitiveness and economic health, and thus to its sustainability.
- Government should be accountable for expenditure of taxpayer funds, and for the expenditure of private/business funds required to comply with regulations.
- Current environmental regulations do not take into consideration the cost that they add versus their benefits. The costs to comply with many laws sometimes exceed their benefits.
- Some alternatives that are ecologically sustainable cannot be implemented yet because they are not economically feasible. Methane production from digestion of manure was mentioned as an example. The fact that something can be done does not necessarily mean that it should be done.
- We need to explore ways to make the prices for energy sources reflect their social and environmental costs. Government should avoid policies that make the price of certain resources (water, energy, etc.) artificially high or artificially low.
- Where possible, we need to let market forces provide the incentives needed to encourage sustainable use of resources. Regulations and policies should be re-examined for the effect they have on the decisions people make. Government policies and programs that artificially encourage unsustainable use of resources should be avoided.

Industry Roles

- We do not lack technologies. We lack the ability to apply existing technologies. We need a directed focus, financing, venture capital, and aggressive banking techniques. We also need to bring together the people who are putting up the money and the people who have worked so hard in the laboratories to develop these technologies.
- The private sector needs to provide support to entrepreneurs from the proof-of-concept stage, through the pilot stage, to commercialization of the final product.

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- Industry's role is to extract all the value they can to improve the quality and content of American life, to convert consumption to investment.

Government Role

- In the fight for national economic security, industry is in the front line, and the role of government is now to support the front line soldiers.
- Government needs to fund research into innovative technologies that sustain the environment. Government should continue to encourage and support demonstration projects. Government should recognize that small businesses tend to be most innovative.
- Government should make loan guarantees or other resources and incentives available to businesses implementing innovative technologies or conservation practices. Some industries (production agriculture, for example) have no way to pass the costs of new technologies/practices to the consumer.
- Government needs to reduce red tape so that businesses and government contractors (GOCOs) can create innovative technologies and market them faster than has been possible in the past. (DOE-ID and Lockheed, for example).
- Government research should focus on the needs of the respective industries. End users should be involved in the development of research goals. In some industries (particularly mining and agriculture), end users currently perceive a wide gap between their needs and the research being pushed down from the top of research organizations.
- Representatives from both agriculture and forestry emphasized that research in genetic engineering should be a very high priority.
- The national laboratories' role is to provide special facilities (that are not fundamentally competitive with industry) and make them available to industry so that they can better understand their processes and techniques and to assist them in international competitiveness.
- Additional informational safeguards for government research are needed. Mining, food processing, and other industries are very competitive businesses. Trade secrets and proprietary information are critical to their survival. Current safeguards on proprietary information in government research are inadequate.
- The government has technologies that it can share with industry and the public; satellite remote sensing, for example. Such technologies could help monitor forest resources and help identify mineral resources without the necessity of drilling holes.
- For cleanup projects, government should work on the markets for the recovered resources. They should demonstrate technologies that not only perform the cleanup,

but also produce products that are usable or marketable to some end user. The form of the recovered product makes a lot of difference in its marketability.

- Some of the government's own activities, particularly at DOE and DOD sites, have not been sustainable. The government needs to correct past errors and ensure that its own present and future activities have minimal impact on the environment.
- Government should not allow small special interest groups that do not represent the general public to disrupt the permitting process or to use the courts and other means to harass miners, loggers, farmers, and ranchers whose activities have been fully permitted by state and federal agencies. (An example is the recent ruling, now resolved, addressing salmon habitat in central Idaho.)
- Sometimes there is a lack of coordination among government agencies, for example between the Fish & Wildlife Service and the Forest Service.

Communication

- The government has a public relations problem. A portion of the population perceives sustainability as an effort by environmental groups to use government to impose their ideas on unwilling industries. This perception is typified by statements such as, "Sustainability—that means people from the city coming out to the country to tell us how to farm and ranch."
- Several attendees at the workshop expressed concern that the government has an agenda that it is determined to pursue, and that it acts on information it gets from the public at workshops like this one only insofar as the information agrees with the predetermined agenda.
- There is confusion about what sustainability means. Different people and groups have different definitions.
- It might be more useful to define sustainability locally, by watershed, for example.
- The general public needs to know why, and to what extent, it is desirable for the U.S. to have sustainable development of resources, particularly mineral resources. Mining, forestry, agriculture, etc. are critical to the welfare of the country, providing for economic growth and providing the raw materials for the necessities and comforts of life. This is not well understood by the general public.
- The government needs to make all publicly funded information sources (laboratory data bases, libraries, geologic information banks, etc.) available to everyone, not just those who have computer links to the Internet.
- Technology has provided many new communication tools. The government should use the appropriate communication tool, like the U.S. Postal Service, to disseminate information. High tech is not always the right tech.

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The workshop also provided representatives from industry and research an opportunity to describe some recent and emerging technological advances that will support sustainable use of natural resources. Highlights include photovoltaic electrical generation at remote sites, processes for removing heavy metal contaminants from large volumes of water, processes that use microbiological activity to remove contaminants from waste streams (biocube technology), polyphosphazene membrane separation, plasma quench, cryogenic cutting, plasma hearth technology, molten metal technology, and others.

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Public/Private Partnership for Sustainable Use of Natural Resources Natural Resource Workshop Boise, Idaho, February 1-2, 1995

1. Introduction

John H. Gibbons, Assistant to the President for Science and Technology, recently said

The world's population, which is growing exponentially, may be on a collision course with our natural environment. Environmental degradation has become apparent on all scales—from local air and water pollution, to global loss of plant and animal diversity, to alterations in the earth's climate system. Clearly, our relationship with nature has changed profoundly.

However, we can create a future where our economy and environment both thrive. Technology must be the bridge to that future. Environmental technologies have a key role to play in achieving those fundamental goals.

Our goal [in the Office of Science and Technology Policy] is to build a sustainable economy—an economy that provides jobs, security, and good quality of life for all Americans—while at the same time allowing us to achieve our goal of restoring and protecting the environment. That is a sustainable economic future.

The White House has established an interagency environmental technology initiative. The goal of this initiative is to develop a National Environmental Technology Strategy, and put it into action by Earth Day, April 1995. This strategy seeks to build long-term economic growth that creates jobs while improving and sustaining the environment.

The White House created the National Science and Technology Council (NSTC) to lead the initiative. The NSTC is sponsoring a series of workshops and events throughout the nation, including a major White House Conference on Environmental Technology. The NSTC will then guide the preparation of the National Environmental Technology Strategy, which includes identifying and implementing policies that stimulate effective public/private partnerships.

Among the workshops was one held in Boise, Idaho on February 1-2, 1995. The workshop was sponsored by the White House and hosted by the Idaho National Engineering Laboratory (INEL), Department of Energy Idaho Operations Office (DOE-ID), and the State of Idaho Department of Commerce. The focus of this workshop was "sustainable use of natural resources." The workshop addressed sustainable use in terms of economic and environmental concerns, for as one participant stated, "Maintaining and enhancing our environment is not and should not be in conflict with economic development." The workshop gave representatives from industry, academia, research, the public, and local and state government an opportunity to provide input to lawmakers and policymakers in Washington, D.C. who are establishing a National Environmental Technology Strategy. The participants addressed these questions:

- What obstacles are restricting the application of technologies for a sustainable development of natural resources?

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- What tools are needed to encourage sustainability?
- What role should be adopted by industry, the public, government, and academia, etc. to encourage sustainable development of natural resources?
- What kind of institutional infrastructure is needed to support sustainable development of natural resources?
- What kind of information is needed by all stakeholders (participants) to promote sustainable development of natural resources?
- What should we (the people) do next, and what should the White House do?

This report is the result of that workshop. Its purpose is to present the context of the major points listed in the Executive Summary and to present the complete papers and reports so that policymakers may understand Idaho's concerns.

The workshop consisted of several general sessions, two panel sessions, and three focus group sessions. The first panel session consisted of presentations given by industry panelists and technical panelists addressing the six focus areas designated by the workshop: agriculture, water, mining, forestry, energy, and environment. The other panel session addressed issues related to the infrastructure to support sustainable use of natural resources. For the focus group sessions, attendees separated into six groups to discuss issues related to each of the six focus areas. Rather than present the speeches and reports in the order they were given at the workshop, this report groups them according to their similarities. The agenda in Appendix A shows the original order.

Section 2 provides the focus group reports for the six areas.

Section 3 consists of keynote speeches delivered during the general sessions. These papers were presented by the Governor of Idaho and representatives from the White House Office of Science and Technology Policy, DOE Headquarters, DOE-ID, State of Idaho Department of Commerce, and Lockheed Idaho Technologies Company, contractor at the INEL.

Section 4 consists of the papers of the panelists who addressed the six focus areas mentioned above. It includes an industry panelist paper and a technical panelist paper. Industry panelists addressed policies that impact their ability to conduct business sustainably. Technical panelists addressed research and development of technologies that could aid business and industry.

Section 5 consists of the speeches delivered by the panel on Infrastructure for Sustainable Development. The panel was composed of six panelists representing state government, business (banking), Shoshone-Bannock Indian tribes, DOE, and universities.

Section 6 consists of the other general session papers. These papers were presented by representatives from the INEL Citizens Advisory Board, Idaho Conservation League, and the Idaho Council on Industry and the Environment.

Appendix A contains the workshop agenda. Appendix B contains tables from the focus group reports.

2. Focus Group Reports

This section contains the focus group reports. These reports are important because they represent the main vehicle through which attendees at the workshop are able to communicate their ideas and concerns to policymakers and lawmakers in Washington, D.C.

Three times during the workshop, attendees separated into six groups, called focus groups, to discuss issues related to each of the six focus areas addressed by the workshop—agriculture, water, mining, forestry, energy, and environment. The focus group meetings were attended by representatives from industry, research, academia, government, the general public. The format of the focus group meetings called for a discussion of the following questions:

- What obstacles are restricting the application of technologies for a sustainable development of natural resources?
- What tools are needed to encourage sustainability?
- What role should be adopted by industry, the public, government, academia, etc. to encourage sustainable development of natural resources?
- What kind of institutional infrastructure is needed to support sustainable development of natural resources?
- What kind of information is needed by all stakeholders (participants) to promote sustainable development of natural resources?
- What should we do next, and what should the White House do next?

Two of the six questions were addressed at each of the three focus group sessions; that is, the first two questions were addressed at the first focus group meeting, held during the afternoon of the first day of the workshop, and so on.

Each of the six focus groups had a facilitator and a reporter. For each focus group meeting, the reporter took notes during the meeting and then presented an oral report at the subsequent general session of the workshop. The reporters also prepared a written report to be included in this publication. This section of the report on the workshop consists of those six focus group reports.

The content of the focus group reports was also influenced somewhat by the structure of the workshop. For example, for each of the reports, the discussion at the first focus group meeting was framed by the context of presentations given by the industry and technical panelists who spoke earlier that day. Two panelists (one industry panelist and one technical panelist) addressed each of the six focus areas. Those speeches are in Section 4 of this report. The discussion at the second focus group meeting was framed by the context of the panel on infrastructure. Those speeches are in Section 5 of this report.

2. Focus Group Reports

Minutes of the Agriculture Focus Group

Introduction

For the purposes of this focus group, we began by defining the agriculture industry as including farmers, food processors, farm credit groups, equipment manufacturers, service providers, commodity groups, government, regulators, education institutions, and research institutions.

Question 1: "What obstacles are restricting the application of technologies for sustainable use (or development) of natural resources?"

- **Economic Constraints:** This was ranked highest overall by the group. Economic constraints for agriculture are capital investment costs, farm policies, very small profit margins, and the economic ability to implement new technologies.
- **Lack of early customer involvement:** When research or technology development initiatives were begun, the actual customers, be it the farmer or the processor, weren't involved in the projects right up front; therefore, research projects that were developed in essence missed the mark or delivered something that can't be integrated into the system. This is a real challenge even in the researcher's mind because of the diversity of the agriculture system. It's not like going out and getting the big three auto makers or somebody in the room and saying, "okay, what are we going to do?" You've got hundreds and thousands of farms within a single region, and from farm to farm things could be dramatically different.
- **Information management systems:** This does not mean there is a lack of information to agriculture, but rather a lack of integrated systems that could manage and handle the information. Running an agriculture operation, whether it be a processing facility or a production farm, involves a tremendous amount of information that you have to process on a daily basis: What's your weather? What's your soil conditions? What's your market conditions? What are your economic incentives for your farm program? What are regulative constraints and various other things? So the systems should be integrated to manage this information to enable farmers, ranchers, and processors to make decisions. We need an integrated information system.
- **Funding for applied demonstration projects:** This means taking the technologies from bench testing to a farm or a processing facility where it can be demonstrated.
- **Conflicting government programs/policies:** One example: a few years back, government said that everybody should bury their fuel tanks, and now government is telling us to dig them up. Dr. Ledbetter gave the example of a government program many years ago that required cutting down all the trees along the stream beds, and now government wants to put all the trees back. So government programs can conflict, and that is the big issue the farmers want these groups to solve.
- **Complexity of agriculture biologically, and farm diversity:** Not only are we dealing with a biological system that is extremely complex and difficult to model and understand, but

there is diversity of individual farms and processing plants. The diversity of the entire agriculture system is so great that it is difficult to get your arms around it.

- **Institutional reward and incentive systems:** The incentive or reward systems of the various research institutions are not structured to provide incentives for transfer of technologies to the customer, but rather are centered around publications and other academia measurements.

Question 2: "What tools are needed to encourage sustainability?"

- **Economic incentives: tax credits, etc.:** Economic incentives rank right up there with obstacles (economic constraints). Tax credits were rated high by those involved in implementation of the technologies. One example: you can make a capital investment to install a dairy barn that would protect the environment, but that doesn't provide you any bottom line return back to your operation. We need credits or incentive systems so that these technologies can be implemented and put into practice.
- **Systems integration and analysis tools:** These would be things that would allow producers or processors to make decisions on the most effective technologies and things like that.
- **Accurate input pricing:** This was an issue for researchers. Identification of sustainable technologies to be developed that can be economically implemented can be difficult when agriculture-system input prices are unreasonably low or unreasonably high and do not reflect the actual cost of the system inputs. For example, water is often priced unrealistically low or high, and this artificial pricing dramatically affects incentives for implementation of water-saving technologies. If water is inexpensive, there is no motivation to pay for and implement water-saving technologies.
- **Ability to predict results of management systems (simulation models):** This issue was important for government representatives and regulators in our group. Simulation models provide the ability to predict the results of management systems. This comes back to implemented or integrated information systems. Are we making the right decisions when we apply our fertilizer or chemicals, or manage our dairy operations to have impacts that positively affect the environment and also positively affect our bottom line?
- **Modify existing policy tools:** This comes back to our farm programs, which are currently prescriptive and inflexible for a diverse agriculture system. The "one-prescriptive-policy-fits-all" philosophy is clearly unable to apply to all agriculture operations.
- **Tools to encourage international level playing field:** This refers to tariffs and trade restrictions and things like that. American agriculture clearly has the ability to successfully compete for international market shares, which increase profitability. However, trade restrictions, tariffs, etc. inhibit agriculture's ability to gain market access. This prevents improvement of our production infrastructure with ecologically

2. Focus Group Reports

sound productions tools and encourages the world market to consume grain produced on land cleared of rain forest.

- **Research to understand processes:** This one was ranked high in importance by representatives from education and research institutions, based primarily on the nature of their jobs. Research to understand the processes of production agriculture, that is, why have the current agriculture practices evolved to be used and what are the variations in the practices between regions. This information would provide a systems approach to focusing in on conducting research of greatest benefit. This is not an uncommon approach for many industries. For example, chemical companies conduct research regarding the practices for controlling particular pests and the magnitude to which that pest affects crop production. This information then guides R&D for new pest control agents.
- **Incentives to prevent urbanization of farm ground:** The issue is that individual farmers own this land, and if urbanization comes around, they typically sell out because of the price advantage; they can then go somewhere else and farm. The selling of the land does not consider the land's productivity, but rather just the price encroaching urbanization brings.
- **Better agriculture statistics on current agriculture practices:** This would provide a baseline on which to judge new technologies or to start from for the development of new sustainable technologies. For example, if a project has the goal of improving water quality, this might be accomplished through reducing soil erosion and better management of chemical inputs. Currently, there are national and even regional estimations available on soil erosion and chemical run-off into our water, but the baseline information is quite vague, and this lack of accurate statistics on agriculture practices holds true for nearly all aspects of agriculture. Baseline information is needed to ensure that technologies are achieving sustainable goals.

Question 3: "What role should be adopted by industry, etc. to encourage sustainable use of natural resources?"

- **Environmental quality is a social good; therefore, associated costs must be paid for by society:** Practices and technologies that promote environmental quality benefit society as a whole. Unlike some other industries, production agriculture has no mechanism to pass the costs of implementing these practices and technologies on to the consumer. Current government policy is to keep food prices low. Commodity prices are determined by forces beyond the control of the producer. Since agriculture producers cannot simply raise the prices of their products to cover the costs of sustainable practices and technologies, these costs must be subsidized through other mechanisms.
- **Provide incentives to farmers to adopt new technologies:** Many technologies require capital investments that do not contribute to a producer's bottom line, so government needs to provide some incentives to growers and producers to make these investments.

2. Focus Group Reports

- **Make technologies affordable:** Research institutions need to develop and promote new technologies and practices that are economically feasible to implement, recognizing agriculture's small profit margin.
- **Transportation costs; modes of transportation (minimize trucking, maintain rural spur lines):** Transportation by rail is more efficient than trucking. However, there has been a shift away from shipping by rail toward more shipping by truck. With the rail system, it is difficult to get cars at harvest time, and sending small trains on spur lines into rural areas is not economically viable. We need to figure out some way to operate and maintain those lines more effectively so that we use the rail more and trucking less.
- **Maintain a collective voice for support of incentives to implement sustainable technologies (GATT):** Producers cannot afford sustainable technologies that do not directly contribute to the profit margin. New trade agreements (GATT) are being negotiated that expressly prohibit subsidies. We need to consider these trade agreements as we develop incentives for sustainable technologies and practices.
- **Look for ways to pass on the cost for implementing sustainable technologies to consumers:** The industry needs to unite and begin negotiating with the actual customers that purchase/distribute the finished product, such that mechanisms can be established for passing on these costs. Right now you can buy a value-added meal at a fast food restaurant for \$1.89. The value that is added doesn't get passed back to the producer. Retail distributors gain marketing advantages for distributing products produced using environmentally friendly methods, but the investment in sustainable technologies is paid by the producer. Either directly or indirectly, the retail distributor and the ultimate consumer should contribute to the implementation of sustainable technologies.
- **Government should set goals—general parameters that are outcome based rather than being prescriptive; these goals need to be realistic:** Tell us that we need to keep the crap out of the creek, but don't tell us how to do it. Government should establish outcome-based guidelines rather than the prescriptive guidelines we have now that tell us exactly how to do it. The people who write the regulations should be realistic about it, and the regulations need to be enforceable or achievable. By *realistic*, we mean, for example, some of the issues with the Snake River water system. If we took civilization away and took out all the dams, about once every 7 to 10 years some of those streams will dry up. There is still going to be a water flow problem. These are the kinds of things that need to be considered by those who write the regulations.
- **CRP maintained but with more flexibility:** The conservation reserve program (CRP) and the set aside program are programs that pay farmers as an incentive to set erodible lands aside. This program is about to end, possibly with a new farm bill. These programs do provide an environmental benefit. If farmers don't have some way to get a return from that land, they can't keep it in these environmentally friendly programs. There needs to be some kind of an incentive payment or income coming off the land; otherwise, the owners of that land can't even pay the property taxes, let alone the other costs associated with owning that land. They have no choice but to put the land back into production.

2. Focus Group Reports

- **Endangered species act, clean water act, and other environmental acts (incentives to producers to increase habitat for endangered species):** These laws and regulations need to provide incentives to producers to increase habitat or support quality habitats for endangered species. Producers, and agriculture as whole, are in the business of producing things. Right now, the way the system exists, if a farmer has an endangered species on his property, he doesn't want to tell anybody about it, because if he does, someone from the government will come out, right a regulation on that place, and take the land out of production. The farmer ends up losing income. Let's turn this around. Since producers are in the business of producing things, why not pay them to produce endangered species, or give them some incentive to provide the habitat for the endangered species on their land? This approach would provide incentives to producers to take care of the ecosystems that they are stewards over, and it would increase the likelihood that landowners would report the presence of endangered species on their land.
- **Industry should identify unsustainable practices:** The industry is not very willing to do this right now, given the instability of the regulatory environment and the power held by the regulators. It is the industry's fear that if a practice is defined as unsustainable, the result will be an immediate regulatory impact on the industry rather than an investment in the development of sustainable technologies that would replace the undesirable practice. Therefore, all participants agreed that dialogue between industry and government should work toward stabilizing the regulatory environment such that industry could begin characterizing unsustainable practices and work with the research communities, funding agencies, and regulators to develop sustainable technology solutions. Government should avoid the kneejerk reaction of simply banning a practice identified as unsustainable.
- **Researchers should identify customer needs:** Researchers and the research funding communities need to develop mechanisms to work more closely with the customers and further identify needs of the ultimate customers (farmers, food processors, etc.), thereby directing research program deliverables toward the needs of those customers.
- **Explore ways for industry to be self-policing:** As government budgets are reduced, the enforcement agencies will not be able to keep up with enforcing the policies, yet right now the industry has no way to finance the policing of these policies. There needs to be some kind of mechanism in the industry to facilitate self-enforcing of regulations. This includes mechanisms for actually doing the enforcement, and mechanisms for financing the effort outside of the federal budgets and outside of federal control.
- **Summary:** *Role of industry* is to work with government to set goals, develop outcome-based regulations that are enforceable and achievable, and explore ways for industry to become self-policing. *Role of government* (and industry) is to sponsor research to both develop and demonstrate sustainable technologies/practices.

Question 4: "What kind of institutional infrastructure is needed to support sustainable use of natural resources?"

- **More involvement of end user:** The end user needs to be involved in the development of the infrastructure and the technology for any sustainable resource system.
- **Entitlement programs should not or should be with USDA?:** Initially the group agreed that the entitlement programs should not be with USDA, because they detracted from USDA's mission. However, upon further discussion the group concluded that in general, the entitlement programs are Congress' favorite portion of the USDA budget and garners USDA the greatest Congressional support. Furthermore, these programs not only feed people in need, but purchase agriculture products to feed those people.
- **Better research typically comes from private enterprise:** Private institutions and academic institutions operate with different reward and incentive systems. Private research institutions typically are highly motivated to deliver products and services out of their R&D investments; if they don't deliver satisfactory results, the funding (which originates from contracts with paying customers) terminates. Private research institutions' incentives are directly tied to delivering usable results. In contrast, some of the government and academic research institutions are more motivated in the direction of publications, winning competitive grants, and other things that are not directly connected to the needs of those institutions' customers.
- **USDA's research priorities have shifted to germ plasm enhancement and away from applied variety development—this is undesirable:** USDA research priorities have shifted from extensive plant breeding programs for applied variety development to fundamental germ plasm enhancement. Currently, the private sector does a lot of variety development for those crops for which the variety can be protected and producers must return to the source for seed. However, the profitability drivers for industry prevents efforts on crops (wheat for example) that are not easily protected. In these instances, it is still appropriate for public institutions to maintain variety development programs. Though germ plasm enhancement is valuable, it is not desirable for USDA to emphasize germ plasm enhancement at the expense of applied variety development.
- **Good practical input concerning the customer's needs is being red-flagged by Washington/regional committees; for example, herbicides/pesticides:** Research programs that are coming out of Washington or managed by regional committees typically are not in touch with growers' needs or the needs of the agriculture industry as a whole. For example, USDA's Sustainable Agriculture Research and Education (SARE) program requires early customer involvement in the development of funded projects. However, project proposals are also closely reviewed by regional committees, and if there is any mention of herbicides or pesticides in the proposed projects, the proposals are generally flagged and thrown out. This practice can inhibit research that might actually reduce the use of pesticides or herbicides. This also represents a significant diversion from the industry's real needs. Competitive grant programs such as SARE need to also consider the use of herbicides/pesticides, not just alternatives.

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- **Research is driven in the wrong direction and is not-user driven; research is not locally relevant (On the positive side, USDA's SARE program did require user involvement):** Even though USDA's SARE program has a hangup with any mention of pesticides, this is one program in USDA that does have some mechanisms for involving growers in the development of proposals. There is strong sentiment that the end users need to be involved in the development of the research goals and even individual projects.
- **Continue USDA: ARS, CSRS, NRCS, Extension, etc.:** There is some talk in Washington about dismantling the USDA or some of its programs. There was strong sentiment in the group that losing the USDA would not be desirable. The services of USDA were regarded as very valuable to the agriculture industry.
- **Modify USDA to support new goals of sustainable use of natural resources:** In the reorganization of USDA and other federal agencies for that matter, the agencies should restructure themselves for the attaining of national goals of deploying sustainable natural resource technologies. Agency restructuring should also include mechanisms for interagency cooperation, facilitate industry/customer involvement, and work with state and regional groups to ensure maximum return on investments and deliverables that hit the mark.
- **Paradigm shift:**
 - 1—top officials need to reevaluate integrated systems
 - 2— growers need to look at how they produce in a different way:

There is a definite conflict between what the end users in the agriculture industry perceive they need versus what they perceive is being pushed down from the top of the research organizations. There needs to be a meeting of the minds between the top officials that run the competitive grants programs and the growers and producers, that is, the end users. The officials need to reevaluate what they are putting out and understand, for example, that research on pesticides doesn't necessarily mean more pesticide use, that this kind of research can reduce pesticide use. On the other hand, growers need to recognize that continued long-term use of pesticides is not sustainable, and they need to start exploring and promoting alternative management practices so that the ultimate goal of sustainable agriculture practices can be achieved. It was the group's feeling that the research agencies that are running things now are trying to immediately abolish use of chemicals and pesticides, while the growers who are trying to make a living know that if they don't use their chemicals and pesticides this year, they won't have a crop. So there needs to be some coming together there.
- **Reevaluate what government considers a farmer:** There needs to be some reevaluation of the definition of a farmer. Including hobby farmers in the definition actually distracts from clearly identifying needs of our primary producers and processors. If research institutions and government agencies are going to have customer involvement, they need to make sure they are talking to the customer.

Question 5: "What kind of information is needed by all stakeholders to promote sustainable use of natural resources?"

- **Does the technology/practice work? What will it cost? Who is going to pay?:** There are three questions that the group felt needed to be answered. Do the technologies and practices being implemented or proposed actually work? There is considerable concern about what kind of risk is involved in implementing these technologies. What kind of capital investments are we going to have to be dealing with? These analyses also need to include estimates on return on investment. Will the producer, processor, etc., carry all the cost of implementing the sustainable technologies, or since many technologies clearly benefit the public to a greater extent than the agriculture industry, will the public sector pick up the cost of these technologies? (Remember, producers cannot pass these costs on to their buyers.) This question involved the identification of incentive programs, low interest loans, tax credits, etc. Additionally, many retail distributors benefit from marketing products produced with sustainable technologies. Mechanisms need to be identified for those benefiting to share some of the cost.
- **Information exchanges between public, private/government, industry academia; coordination and trust to reach common ground:** When these technology agendas are developed, and the agencies are deciding what technologies need to be implemented, the agencies and the people out on the front line of the industry need to exchange information and work together to facilitate delivering the technologies and systems that will not only serve the needs of the end users, but also achieve the global objective of implementing sustainable practices and technologies. Suggested mechanisms for the coordination and exchange of information include ad hoc committees, using the Internet (as it becomes more available), multimedia technology, or whatever.
- **More baseline information on tillage cultural practices, pesticides and fertilizers, and groundwater quality:** Baseline information could probably help us understand what is sustainable. What agriculture practices are predominately used, and what are the impact of these practices? How much water is actually going in and coming out of the ecosystem? We lack sufficient baseline information to determine which new technologies are truly sustainable and provide the biggest beneficial return for our investment.
- **Establishing priorities; one size does not fit all, i.e., flexibility:** In establishing priorities, we must recognize the diversity of the agriculture system, and it is not practical to assume that at the national level or even at the state level it is possible to propose and establish prescriptive priorities for implementing sustainable technologies. Rather, we must establish robust priorities with general guidelines, such as, "Keep the crap out of the creek," and leave it to those out on the front line of agriculture determine the best means to accomplish that goal.

Question 6: "What should we do next, and what should the White House do next?"

- **Committee at the state level to advise on sustainable use of natural resources:** Begin to establish local working groups that may successfully help facilitate implementation of sustainable technologies on a local level.

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- **White House should propose extension of the soil conservation districts:** The White House proposes extension of the USDA soil conservation districts model for implementing national priorities/research agendas. USDA, DOE, EPA and other agencies are about to be revamped and reorganized. The White House should use the model of the soil conservation district to direct the local research and development of sustainable technologies and practices. This system works. Soil conservation districts are directed at the local level by elected, unsalaried committee members. These committees are the ones that make the decisions on grants and research projects as they relate to soil conservation in their districts. Some examples include dike building and erosion plans that are going in on the upper Snake River and various other places. It's these local conservation districts that decide whether it is the dike system or a levy system or some other kind of system that is the most appropriate for that conservation district. They also award the grants to participating farmers to accomplish the implementation of these technologies or research projects. In reality this model has worked well for implementing technologies at a local level under the direction of a larger central mandates of improving soil and water quality.

Such a system would have general guidelines and pots of money at the federal level. For instance, with water quality initiatives, the federal agency would draw from that pot of money and send it down to the local soil conservation districts. In the upper Snake, for example, over towards Jackson Wyoming, the problem with water quality is soil erosion. So the soil conservation district implements plans for spending that money to reduce soil erosion along the Snake River. In the Twin Falls area, there is soil erosion on one side of the river, where farmers use flood/furrow irrigation, but on the other side of the river the farmers use pivot sprinkler systems, and the water quality problems may be something entirely different, problems due to cattle feedlots, for example, so the district might implement lagoon systems there. The idea is to have a central pot of money that can be distributed, general federal guidelines directing how the money is to be spent, and local people who can then apply that money to local programs. That way we are addressing national issues and local issues simultaneously. Soil conservation districts are already in place and working. A similar system, or an expansion of this system, is a possible way to implement the broader objectives related to sustainability.

- **Government (White House) should get together with end users to rethink the direction of agriculture research and granting:** The White House needs to work with the end users to ensure that agriculture research and granting institutions are meeting their needs for sustainable technologies. In agriculture, this certainly is a challenge, considering the diversity of the system.
- **White House should provide input into the farm bill, advocating, for example, that we extend USDA lending authority to provide low-interest loans for sustainable technologies:** USDA does have lending authority, and a possible suggestion would be to extend the USDA lending authority in using low-interest loans as an incentive for implementing some sustainable technologies.
- **White House should provide feedback to us from their review or the report of this workshop, before final draft of policy is written:** The agriculture focus group would

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really like the opportunity to have feedback from the White House to make sure that the ideas being put forward are in line with their suggestions.

- **Workshop report suggestions should be sent to appropriate agencies:** The focus group also thought that it would be a good idea that the report, with their concerns and suggestions, be forwarded to the appropriate agencies, DOE, USDA, EPA, Department of Commerce, and others.
- **Workshop report should be sent to Congress:** The concerns and suggestion documented in the workshop report should also be sent to Congress, that is, to Congress in general, to appropriate Congressional committees, and to the Idaho Congressional delegation, so they can be aware of the needs and concerns coming from this region.
- **Industry/stakeholders should write to Congress:** Industry/stakeholders need to update the Congress, and again industry needs to take the responsibility to inform the Congressmen about their participation in this workshop.

2. Focus Group Reports

Minutes of the Water Focus Group

Introduction

The water focus group is diverse, with the representatives of

- Power producers
- Public sector (nonregulatory government), which includes Department of Fish & Wildlife (Bonneville Power)
- Universities
- Industry (recreation, potato processing)
- Government (power licensing, water rights protection, resource development and environmental planning).

Water is a difficult issue to discuss; and while some may have wanted to categorize a lot of the ideas and thoughts that came out of this session, the group insisted on maintaining the individual thoughts that came out, so there is a rather lengthy list.

Question 1: "What obstacles are restricting the application of technologies for a sustainable development of natural resources?"

- Competing uses for water and lack of availability—too many uses and not enough of the resource
- Controversy over water, and no commitment to compromise—in general a lack of incentive to sit down and talk about all the issues and search for possible win-win situations
- Existing processes not working (FERC & hydro power licensing takes 20 years, e.g.)—red tape and long-lead times for actions related to water usage
- General lack of information (scientific, watershed, etc.)—decision making based upon less than adequate information, and conflicting sources of information
- Tradeoff between gathering information and taking action now—in lieu of having good information, there is a strong influence to take action anyway
- Lack of communication—all interested parties are not talking with one another
- Need a mechanism for coordinating user's needs—obviously to facilitate communication
- Past uses and the quantities of water corresponding to those uses are not compatible with the future; existing water law and the allocations of water people are "entitled to" inhibits conservation—"use or lose"
- Greed—people want the most and best water they can get

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- No thought given to the amount of water wasted and/or the resulting quality; this is not intentional, simply no incentive to give much thought to these things
- Need for research on water resource to provide for general and scientific watershed information
- Cost of collecting information is a concern; Cost of water treatment
- Window of opportunity for gathering data presents a problem for attaining good and consistent data—season, depth, technology, perspective
- Time required for decisionmaking regarding water resource is too long now
- Lack of continuity in resource management; variability in political emphasis—creates problems in carrying out plans that take long periods of time
- Resistance to change in adopting new technologies—either from basic human nature, perceived risk of implementing new technologies, etc.
- What is success? What is optimum use mix?
 - The Thousand Springs discharge rate at Hagerman?
 - Water quality?
 - Aquifer maintenance?
 - Storage amounts?
- Conflict between conservation of water and ongoing supply
- Poor water quality: chemical (organics), physical (turbidity), temperature
- Local cultures (habits, customs, practices, etc.) as they pertain to water use & management

The water focus group next rated these obstacles concerning the impact they had on sustainable development. This information is contained in Table B-1 that is in Appendix B.

Question 2. "What tools are needed to encourage sustainability?"

These were the lists of tools recommended and all of them scored above an average of 4 in priority people gave them (see list below, and rankings in Table B-2). The first and second on the list were need for education, communication, forums, new and innovative communication forums. The third one is incentives for participation in change and the sacrifices and costs involved there. The fourth one is reevaluating existing water law and all of these have scored highly so far. The fifth one is reviewing administrative institutions for their effectiveness. The sixth one was felt to be very important one during the discussions but apparently it didn't score very well: Information management tools, development of them and access to them. The next one is research directed towards specific problems solutions. That scored rather highly. And the last one is proactive settlement of water resource problems and avoiding readjudication, etc. So all the recommended tools and solutions appear to score very highly.

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Tools:

- Education of stakeholders and the public
- Communication methods and new forums for communication between all parties
- Incentives for stakeholder participation in working through solutions to the water resource problem
- Re-evaluate existing water law, in context of present day problems of water availability and water quality
- Review administrative institutions for effectiveness in dealing with water resource issues
- Information management tools (development of and access to)
- Research directed toward specific problem solutions
- Non-adversarial resolution system for dealing with water issues
- Supportive of entrepreneurial climate; encourage market oriented (viable) solutions
- Proactive settlement of water resource; avoid adjudication.

Question 3. "What role should be adopted by industry, the public, government, academia, etc. to encourage sustainable development of natural resources?"

Government:

- Facilitate and fund public access of information regarding water issues and scientific data
- Set standards/goals proactively and avoid specifying how the standards are to be met (regulation is necessary, but not command and control)
- Research to provide good information on water resource
- Collaborate on exercising authorities and resources through all levels of Government (state, federal, local)
- Resource management through effective planning and implementation— include new science and information in open-ended, ongoing, dynamic planning
- Provide incentives for stakeholder participation in resolving water issues
- Rules based on good science (solid relevant information)

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- Cumulative Impact Management—consider cause and effect and resulting cumulative impacts of decision making.

Public:

- Active involvement in decision making and planning
- Access to and use of information
- Drive the government, after all we elect them!

University:

- Education— K through 12, undergraduate, graduate, professional and technical
- Research (basic and applied)
- Cooperative agreements between industry and government
- Information accessibility and ease of transfer.

Business & Industry:

- Pollution prevention and related research to implement the concept of sustainable development
- Full process assessments—focus process and design decisions based upon full cost accounting including environmental externalities
- Provide adaptive management techniques for cumulative impacts management
- Problem-solving focus built into entire way of doing business (structure of business, and focus of expertise).

Question 4. **"What kind of institutional infrastructure is needed to support sustainable development of natural resources?"**

- Goals understood and agreed upon throughout all sectors and a developing trust— all requiring good planning
- Planning for sustainable development must be done regionally, nationally, and with business
- (New) forums for facilitation and communication are necessary
- Incentivizing and encouraging statutes—statutory requirements encouraging the right thing to get done; demonstration of success as a major criterion, not dictating how.

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- Structure for flexibility and stability in dealing with complexity with appropriate technology-based standards, that is technologies continuing to emerge are often disruptive to the regulatory world because "best demonstrated" changes as time goes on
- Level playing field and fairness for all players.

Question 5. "What kind of information is needed by all stakeholders to promote sustainable development of natural resources?"

- For interpretation of goals and requirements (consensus driven goals, buy-in up-front with ownership from all stakeholders)
- Stakeholder requirements— demographic, societal needs and expectations, resource accounting, watershed information, etc.
- Criteria of success for decision making
- Use of a "watershed" approach that uses information about the water resource, and specific data for decision making and evaluation of consequences
- Additional scientific information for understanding the water resource—general and specific.

Question 6. "What should we do next, and what should the White House do?"

- White House should develop and facilitate a procedure for a "watershed" approach to water resource management
- As part of the procedure, interactive stakeholder participation should be encouraged (required?)
- White House should designate someone responsible for the procedure and make sure an infrastructure is available to local authority for the procedure
- White House should facilitate and collaboratively support research and development on common tools and post-implementation evaluation by users (sensors, data gathering instruments) on agriculture practices, manufacturing, transportation, habitat changes, remedial practices, etc. (This does not mean just dollars.)
- White House to modify the Federal Advisory Committee Act to allow interactive participation (precludes consensus decision making) and allow participation of a cross-section of people that includes federal employees
- White House should encourage regulations that state a standard, but not how to achieve it, and allows for innovation; less specific, preventative, objective standard oriented.

General Themes

The recurring theme from this small group was that the decisions that occur regarding water differ so greatly, and this points to an information and communication problem.

Other themes

- Flexibility in regulatory standards (what not how)
- Education is important
- Good scientific data needed
- Definition of what "success" is
- Need incentives for people to work together
- Historical practices, habits, customs are not in tune with today's problems.

2. Focus Group Reports

Minutes of the Mining Focus Group

In addition to the three assigned members of the Mining group, four additional people attended. Dave Wessman opened the session by explaining the ground rules under which we wanted to operate and the questions that we wanted to answer during the session. Before discussing the questions, the group expressed several concerns:

- It is possible that the administration has "the answers" already decided, and that the input provided in this meeting will be accepted only to the extent that it agrees with the preconceived conclusions.
- The small group at this focus group meeting does not adequately represent the mining industry. The industry is extremely diverse, and miners' problems are very site- and process-specific.
- With regard to mining, the National Science and Technology Council (NSTC) approach appears to address the environment to the exclusion of the industry's competitiveness and economic health, and thus to its sustainability.

Question 1: What obstacles are restricting the application of technologies for sustainable development of natural resources?

The groups responses were as follows:

- There is no effective national policy on mining. The Bureau of Mines is a small agency under the Department of Interior. Since its mission is somewhat contradictory to that of its parent agency (exploitation of resources versus conservation of resources) it is a "stepchild." Budget cuts are being disproportionately allocated to the Bureau of Mines because of this relationship. Additionally, mining is also "managed" by the EPA, BLM, Forestry Service, etc.
- Access to public land for exploration is limited and difficult. The major areas where mineral resource exploration has not been done are in undeveloped public lands. Even if mining is not allowed on these lands, it is still worthwhile to explore their mineral wealth to determine what potential national resources exist. Since many minerals are rare and are vital for national security, this is a good idea. Public lands are generally managed by the BLM or Forest Service. These agencies have goals for exploitation of forests for wood products; however, mining exploration is a nuisance to them. They have no incentive to encourage exploration and are generally uncooperative to the idea.
- Most environmental regulations are prescriptive. They should be changed to be goal oriented. An example of this was given by a gold mining representative. They were required to test the effluent of their gold mine for a variety of chemicals, one of which was gold. After several regular reports were made (all showing not a trace of gold!), it was pointed out to the EPA that this requirement was unreasonable (they were extracting the gold, not putting it back in the creek!). Nevertheless, they were still required to spend hundreds of dollars a month on the test for gold. Why not adjust

the regulation to fit the concern, rather than set a hundred requirements for everyone to meet.

- Additional informational safeguards for government research are needed. Mining is a very competitive business. Trade secrets and proprietary information are critical to their survival. Current safeguards on proprietary information in government research are inadequate.
- Regulations change during operations. When exploiting a mineral resource, miners perform an economic analysis to determine whether a mine or process is cost effective based upon current regulatory requirements. Environmental regulations change so often that it is common for standards to change during or after a processing plant is built, making it too expensive to operate. Standards should be "frozen" for a period of time after permits are issued. This would allow a more effective planning process.
- It routinely takes up to four years to acquire all of the necessary permits to begin mining activities. This is too long! One year would be more appropriate.
- Environmental regulations do not take into consideration the cost that they add versus their benefits. The costs to comply with many laws sometimes exceed their benefits.

Question 2: What tools are need to encourage sustainability?

- Additional remote sensing technology. Many Defense-related satellites can provide better exploratory information than is available to the mining industry now. They suggested that this technology be made available. Secondly, more "non-invasive" exploratory technology is needed to allow exploratory work without having to drill holes all over the landscape.
- Shorter permitting process. See question 1, 6th bullet.
- A national mining organization. No national organizations exist to look after the needs of the mining industry as a whole.
- A mission agency is needed in the government. At present, a variety of agencies regulate and provide assistance to the mining industry. These should be consolidated so that one entity can coordinate all activities.
- An information base should be developed of past practice mining problems. This would allow a prioritized approach to cleanup and point out mining practices which should be discontinued or improved.
- A consistent permitting authority is needed. On public lands, for example, mining permits are required from EPA, the state, BLM, etc.
- Realistic policies for exploration. See Question 1, comment 2.

2. Focus Group Reports

- "Control" of special interest groups. In many cases, small groups that do not represent the general public cause disruption to permitting and mining operations. These groups should not be allowed to sway federal laws and policies.
- Solvent mineral extraction technologies should be further explored.
- The U.S. should advocate international standards for mining. These could include environmental, safety, or other standards.

Question 3: What role should be adopted by government and industry to encourage sustainable development of natural resources?

Government:

- Support mining education at the college level. Mining education is becoming difficult to get. The mining industry needs well-educated employees in order to stay competitive and meet the intent and requirements of existing laws.
- Consider the economic health of the mining industry as one of its highest priorities. If the U.S. mining industry goes away, all strategic minerals will have to be imported. This would create unacceptable dependencies on foreign interests.
- Must have coherent and cohesive policies in regards to mining.
- Look at whether the Department of Interior is the appropriate location for the Bureau of Mines. As discussed previously, these agencies' missions are potentially contradictory.
- Support industry research and development in all aspects, including environmental.

Industry:

- Develop and communicate the needs of the mining industry. The industry, as a whole, has not communicated its needs.
- Educate the public and other stakeholders as to the benefits of the industry. Mining is critical to the welfare of the country by providing the raw materials for growth. This is not well understood.
- Proactively participate in the review and development of U.S. mining policy. The industry needs to work better with the administration on mining policies.

Question 5: What kind of information is needed by all stakeholders to promote sustainable development of natural resources?

- The general public needs to know why, and to what extent, it is desirable for the U.S. to have sustainable development of mineral resources.

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- The general public needs to know how limited and restricted economic mineral resources are.
- The general public and stakeholders need to be able to weigh the comparative values involved in making mining decisions.
- The general public and stakeholders need to find out what can be done to have environmentally sound development.
- The general public and stakeholders need to realize that many mineral products are recyclable. An example is lead. Over half of the lead used today is from recycled material.
- Further technology needs to be developed that will increase the ability to recycle minerals. For example, many alloys of metals are not recyclable. An example might be airplane parts. The alloys involved are so specific that they cannot be mixed with other scrap materials and make usable products.

Question 6: What should we do next and what should the White House do?

The question was answered in two parts. First, **What should the industry do?**

- Cooperate and coordinate with one another.
- Consider a "vision" as to where the industry needs to go for sustainable development.

The second part of the question was **What should the White House do?"**

- The White House should offer its vision of where to head for sustainability.
- Look closely at feedback from industry on their vision and plan.
- Look at the long-term consequences of decisions when reacting to short-term issues. For example, the long-term impacts of budget reductions in the Bureau of Mines might not have been considered when their budget was reduced.
- Continue the NSTC structure, provided that it meets the needs of industry.
- Ensure that industry continues to be allowed to contribute to policy development.

Finally, a quote from Hippocrates:

"... above all, do no harm."

2. Focus Group Reports

Minutes of the Forestry Focus Group

The Forest Focus Group consisted of representatives from Boise-Cascade Corporation, Bonneville Power Administration, Idaho State Lands Dept., the public, and University of Idaho.

Question 1: "What obstacles are restricting the application of technologies for sustainable use of natural resources?"

Four broad categories of obstacles were identified and it was decided to elaborate on specific obstacles in the discussion of tools needed for promoting sustainability. The categories were information, coordination, regulation, and funding.

1. **Information:** Gaps in information and access to existing information.
2. **Coordination:** Problems in coordination/collaboration between agencies, industry, and the public on research and development, validation, and implementation of sustainable technologies.
3. **Regulations:** Notably, National Environmental Policy Act (NEPA), National Forest Management Act (NFMA), Endangered Species Act (ESA)—problems with overly long permitting times, unreasonable/unnecessary procedures, information, conflicting regulations (e.g., state vs. federal), double indemnity (subject to multiple layers of regulation). There is also a lack of government resources to support regulation resulting in selective or random enforcement). Regulators are immune to regulation and have no need or incentive to participate in working out solutions.
4. **Funding:** Not targeted, no incentives to set up coordination/partnerships. Development research not funded.

Note that the definition of sustainability is related to the value systems of involved parties, the credibility of scientists, and scientific information. Communication problems exist between government and the public on scientific information (not available and understandable to all). Another problem is the lack of trust between private industry, the public, and the government.

Question 2: "What tools are needed to encourage sustainability?"

Information:

- Expedite government review of classified DOD information and make non-sensitive information available (i.e., satellite images) to industry and other agencies. This information would be invaluable in evaluating existing resources as well as the effects of past management practices.
- Support of continuing education efforts, including education of the public, as well as resource professionals. Support development and use of distance learning and information access technologies (computer networking, telecommunications, data accessibility).

Coordination:

- Promote communication/coordination between interested parties (cooperative research, tech transfer)
- Develop a mechanism to ensure coordination between involved government agencies (i.e., conflicts/lack of cooperation between Fish and Wildlife Service and Forest Service on endangered species issues).
- Develop methodologies and conduct product life cycle analyses, including true economic and environmental costs of production and of potential substitute products.
- Expedite formulation/implementation of genetic engineering technologies (to allow introduction of genetically engineered plants in forests)

Regulations:

- Change laws to allow federal agencies to manage forests in a sustainable manner based on science rather than politics. Reform and streamline the NEPA process, the process is often prolonged to the point that the resource (timber) is no longer useful.
- Change laws, regulations, and policies to encourage cooperative ventures between interested parties (i.e., protection of proprietary agreements, access to federally produced technologies, expeditious implementation of cooperative agreements, interagency agreements, etc.)
- Federal laws need to be changed to allow the Forest Service and Bureau of Land Management to manage national forests sustainably. Non-forest development needs to be subject to the same regulations (e.g., private home development not subject to road-building standards resulting in badly planned roads, excessive erosion, and other problems). Regulations of the different agencies are often at cross-purposes (i.e., constructing roads per NFMA to minimize impact vs. OSHA safety regulations) or duplicated (e.g., state and federal regulations on spotted owl habitat).
- Licensing of chemicals on public lands subject to different regulations than chemicals used on private land (e.g., methyl bromide cannot be used on national forests, but can be used on private land). Herbicide/pesticide regulations based on best science should be cost-driven, and not politically driven.

Funding:

- Leverage funding to achieve greatest advantage for development and implementation of sustainable technologies (i.e., cooperative research between industry, academia, and government)
- Secure funding to move basic technologies to implementation (i.e., university-developed technologies to industry or to federal lands)

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- Maintain mechanisms (e.g., National Science Foundation program) to fund science infrastructure (e.g., research facilities and equipment—big ticket items universities can't afford and that aren't likely to be funded by industry).

Question 3: What role should be adopted by industry, etc., to encourage sustainable use of natural resources?

Government:

- Government's role should be to bring interested parties together, and establish and maintain a level playing field.
- Regulations should be goal-oriented, non-prescriptive incentives for using sustainable technologies rather than specific regulations.

Industry:

- Invest in opportunities that are sustainable (including investment in research and development).
- Adopt policies that require sustainable forest management—where legal and where competitive.
- Educate the public on activities and how the industry is working toward attaining sustainability.

Academia:

- Be credible generators and sources of information on social and biological relationships between system components and potential impacts.
- Be the catalyst for implementation of collaborations on specific resource questions.
- Educate students, natural resource professionals, and public on scientific aspects of sustainability and impacts of natural resource options.

Private:

- Individuals need to get involved and work through the political process and take a proactive role, including becoming informed on issues, science, regulations, etc.

Question 4: "What kind of institutional infrastructure is needed to support sustainable use of natural resources?"

- Broader based state expertise (i.e., specialists in scientific areas). Often local experts are generalists and do not have the foundation to understand specific problems/questions.

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- Someone local (on the federal, state, and county level) must be responsible for real-time results and integration across resources. Responsible meaning able to make decisions and implement them (not just provide recommendations to Washington).
- Universities need the infrastructure capacity (i.e., facilities, up-to-date laboratory equipment) to partner in scientific R&D. Historically, equipment was purchased and facilities were built and maintained through funding from large government programs like the National Science Foundation, and that those programs are in jeopardy. Industry research partners are not likely to fund the purchase of expensive equipment and facilities and therefore, universities would not be able to compete with national laboratories.
- Make available and use current remote information and communication technologies (email/ teleconferencing) to reduce the impact of physical separation of partners in research.
- More local authority and responsibility than is now available is needed because solutions will be site-specific and relationships between industry, public, and agencies will be less adversarial, and therefore partnerships will be strengthened. Concern was that decisions are often made by groups and individuals who have never "been on the ground" and that by making management decisions without specific knowledge of sites, inappropriate decisions are made.
- Current laws and regulations should be reviewed to ensure that authority to execute the plan is clear. Concern here is that often once a decision is made there are avenues for individuals and various interest groups to block the execution of the plan.

Question 5: "What kind of information is needed by all stakeholders to promote sustainable use of natural resources?"

- Up-to-date spatial and temporal information on natural resource landscapes.
- Long-term Life Cycle Information (to include unanticipated costs associated with product shifts).
- Risk assessment—for change—for doing nothing.
- Basis to validate information.
- Definition of sustainability as it pertains to site-specific applications (i.e., by watershed).

Question 6: "What should we do next and what should the White House do next?"

White House:

- Reevaluate and modify as appropriate existing regulations and provide incentives to facilitate the goal of sustainability.

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- Begin developing the infrastructure recommendations
- Take a proactive stance in reducing adversarial relationships now existing between government, industry, interest groups, etc.—identify gaps in information, regulatory and jurisdictional inequities and conflicts, and work toward remedying them quickly.

Others:

- Be innovative in seeking solutions that will result in sustainable natural resources.
- Take personal and local responsibility to move this process forward (don't wait for Congress/White House if there is a workable, legal solution available locally).

Minutes of the Energy Focus Group

Due to the general nature of the questions, the scope of the group assignment exceeded the ability of the group to respond with complete, organized arguments. In the time allotted to answer the questions, the group attempted more to provide an inventory of issues rather than a thorough analysis. For each question, answers are presented by priority, the most important first.

Question 1. "What obstacles are restricting the application of technologies for sustainable development of natural resources?"

- **The economic environment that the utilities operate in is in a state of dramatic change, in part as a result of deregulation. Clear, constructive regulations should be a federal priority.** There are many conflicts between regulations (e.g., NEPA, CAA, CWA, BLM Land Access, Hydroelectric Permitting); these conflicts need to be resolved. Regulations should be integrated across different government levels, i.e., state, local, and federal. Some thought should be given to the cost/benefit of regulations and technical assistance and to the possibility of reducing the tax burden through the elimination of regulations and assistance. The role of the federal government, and particularly DOE, has not been clearly defined. The natural environment will require some regulatory protection as it is a public good, e.g., a logical interpretation of the Endangered Species Act. The utility industry should be able to operate in a consistent and dependable regulatory environment.
- **Economics issues** must be objectively addressed in order to achieve sustainability. A challenge exists to educate stakeholders in economic realities rather than misperceptions and speculation. Industry needs to provide some of that education. The utility industry is a classic case where scarce resources require efficient allocation. Sustainable development of existing energy forms should be pursued to realize inherent value. Demand and accurate prediction of growth in demand are the driving functions.

More technology development is desired. However, technology is a high economic risk in utilities. More energy efficiency and conservation is desired. A lack of money exists for research and development. Short-term payback vs. long-term focus on money is a strong factor in utility decisions. The industry is greatly affected by savings and investment rates. Value is not accurately placed on external costs—such as the life cycle of money. The changing utilities environment due to deregulation will create enormous economic fluctuations. Economic effects due to regulations on imported energy should be considered. Industry consolidation impedes progress. The Tax code should accurately recognize depreciation of new technology. Regional economics relative to national economics should be considered.

- **The market is an important factor.** Utilities need to do better at communicating their needs. Changing the permitting regulations, etc., to create a level playing field for all entrants to the market should be a priority. Public pressure towards sustainability could positively affect the market. Marketing and education of sustainability would also be a

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step forward. A lack of money for research and development poses obstacles for market development. Intellectual property ownership issues should be addressed.

- **Proper technologies will need to be identified.** Currently, there is a shortage of trained technologists. A lack of infrastructure (e.g., transmission, practice, technology) makes advances difficult. Different technology needs exist for centralized and decentralized applications. Lack of funds for R&D is also a problem.
- **Public policy issues will need to be addressed.** "Not in my back yard" attitudes will need to be countered. Conflicting priorities in the public arena need to be clarified and resolved. Public safety and health should remain a top priority. Local concerns need to be recognized in relation to national and regional issues. Aesthetics of energy production and consumption are a concern in the public arena.

Question 2. "What tools are needed to encourage sustainable use of natural resources?"

First, refer to the responses to Question 1 above, as the tools required are often the solutions to the obstacles listed. Additionally, the group provided these responses.

- **A number of economic incentives** to promote sustainable use in energy production were identified. International trade missions could promote sustainable technology development through opening of markets, attention to global environmental issues, and partnerships with U.S. interests. Opening of trade barriers in the energy and energy-related sectors would lead to a freer market that is more conducive to information exchange and ultimately sustainability. A utility industry equivalent to the Organization for Economic Cooperation and Development may provide a forum to promote sustainable uses in energy production. Stimulate the market to make venture capital for development of sustainable technologies more available. Partnership incentives will connect organizations and companies that share mutual interests but previously did not see benefits of working together. Accurate cost effectiveness comparisons between technologies and energy production methods are needed to promote sustainable technology use. An objective method to determine costs of externalities is needed. The human element should be valued as a resource.
- **Information flow and accessibility of information** will produce a more efficient market and provide an environment for sustainability focus. Efficient databases of technical needs and capabilities was mentioned by the group. Existing databases of energy information need to be condensed and made user friendly, customer oriented, and accessible. Demonstrations and simulations of technologies for sustainable development could be one prominent example of information flow. Lessons learned from technology transfer actions are a valuable piece of information to the energy industry. Better education should be provided on sustainable use issues both to the public and in the schools. Education should work toward correcting misperceptions. A marketing mall or shows for sustainable use technologies would provide a forum to solve technical problems. There needs to be a consensus-building process among stakeholders through free flow of information. Intellectual property rights need to be clearly understood and enforced to maintain order in the ownership of information. Alliances and partnerships should be encouraged to promote the sharing of

information. Better analysis tools should be developed to provide accurate information to decision makers.

- **Regulatory changes and regulatory incentives** can be made to promote sustainable use. Decrease the number and complexity of regulations. Certify technologies and processes in sustainable use. Regulatory mandates will force the market in sustainable technologies. Easy access to regulations and assistance in navigating through complex regulations, especially for new companies, should be provided.
- **Other.** Modernize equipment and bring new technologies online faster. Government needs to be committed to sustainable energy development for the philosophy to become practice.

Question 3. "What role should be adopted by industry, etc., to Encourage sustainable development of natural resources?"

- Develop global vision for goal of sustainable development in energy; alternate scenarios: Encourage international involvement
 - Coordinate information—someone must take the role
 - Develop grassroots support & advocacy, which are important to developing policy & regulations
 - Form a consistent Energy Technology Policy—Encourage U.S. to set real goals & make incentives
 - Identify funding sources
 - Enhance role of recycling.
1. **Develop roadmap/vision/comprehensive long range plan/strategy of the energy industry**—Such a plan should have: Implementation strategies, reasonable timeframes and perspectives, alternate scenarios including small scale technologies, prioritization of needs & technologies. Goals for the U.S. energy market should be clarified and consistent with a "public" energy policy. The role of recycling of materials and energy should be understood. The energy industry should be defined in terms of a global focus. An energy strategy should be developed to meet all human needs.
 2. **Advocacy of sustainable development in the energy industry** including grass roots support from consumers as well as the industry, to policy makers, encouragement of international involvement and partnerships, education for culture change away from nonsustainable development, development of economic accounting in sustainability, technology advocates, and for sustainable use proponents to take a more active in developing public policy. A durable champion of sustainable energy development would provide consistency and strength.

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3. **Economic incentives and validation of definitive technology solutions**—Industry will meet government on funding incentives. Public funding though, should be evenly spread across different technologies to create a more level playing field. Mandates for renewable energy will spur the market. Identification of funding sources will encourage the industry to get involved. The accounting of externalities will encourage sustainable use technologies. The only lasting way to make sustainable development important is through financial incentives from a market drive. The creation of a "Good Housekeeping seal" for sustainable activities would set the mark for others to follow.
4. **Technology development & validation**—The requirements for sustainability should be highlighted to create crisp understanding. Technical resources need to be unbiased in their approach and tackle problems objectively. Model, simulate and visualize technologies for decision making. Expert prediction systems could be one example. Coordination of information should be handled appropriately. International agencies should be involved for the infusion of alternate ideas. Validate and communicate the benefits of sustainable development to industry. Develop technologies based on economic needs. Provide an open discussion of cost and benefits of sustainable technology. Improved energy efficiency is part of the sustainable use equation. Focus on revolutionary technologies to create great changes. Develop alternatives to replace natural resources.

Question 4. "What kind of institutional infrastructure is needed to support sustainable use of natural resources?"

Some specific suggestions made were :

- Have natural resource "Cops" to monitor sustainable use of resources.
- Expand & strengthen the International Energy Agency to raise awareness of energy issues and global dependencies.
- Coordinate institutions & regulators:
 - Coordinated judiciary & legislative rule making and enforcement—federal & state to make rules consistent
 - Too many jurisdictional problems between regulators
 - Eliminate redundancy in regulation and agencies.
- Add energy concerns to the National Science and Technology Council (NSTC) priorities. Currently, energy is not represented. Energy should be added to highlight sustainable use in the energy industry. NSTC needs to function better to show better results.
- Direct sustainable resources funding.

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Group responses in this section also addressed aspects of the infrastructure that is needed.

- Infrastructure for sustainable use should be output oriented, responsive, and provide clear decisions. e.g., reduce the bureaucracy, produce regulatory & legislative reform.
- Financial incentives including clearly defined funding sources
- Improved communication and clear, rapid information exchange
- Global infrastructure for cooperation and incentives to partner internationally are needed.

Question 5. "What kind of information is needed by all stakeholders to promote sustainable use of natural resources?"

- Centralized and accessible information that includes, but is not limited to :
 - Assessment of resources—e.g., sustainability opportunities, projected demand, supply and consumption, etc.
 - Site-specific engineering data
 - Emerging technologies in the sustainable use market
 - Opportunity to understand all different perspectives
 - Explanation of technologies that stakeholders understand and can believe in.
- Constraints Issues Guidelines per resource
 - Environmental, social, institutional, economic, regulatory, physical
 - Guidelines/standards to work towards.
- Economic & Market Information—Costs, Benefits & Risks
 - Risk assessment.
- Goals/Vision/Plan of Action for sustainable development
 - Common goals
 - What done now and what done later
 - Compelling argument for sustainable development.

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Question 6. "What should we do next & what should the White House do next?"

- **White House—Make a compelling argument for sustainable development such that it can stand on its own.** A strong "national commitment" that crosses administrations, congressional terms and political parties, needs to be made. A rational argument should prove that sustainable development is good for the country in terms of economics and quality of life. Recognize the greater "system" problem in sustainable energy development.
- **Make sustainable development an Economic Reality—Motivate sustainable development through Incentives.** The industry needs to see the profit and benefits of sustainable development. Establish "green energy pricing"—have prices for energy sources reflect social & environmental costs.
- **Long-Term Planning** should be done by the administration together with stakeholders. Reduce expectations on renewable—they will only be a partial solution. Reduce long-term expectations on fossil energy. Teach personal responsibility for sustainable development.
- **An Industry Science and Technology Court System modeled after the Japanese Model** would judge the value of sustainable technologies and strategies.
- **Just Do it—U.S. and Industry.** all people involved in using the resource should proceed with sustainable development. Think globally, act locally. Get everyone involved in implementation plans. Stop complaining, but get the attention of legislators and stakeholders through dialogue. Do more than just talk.

Minutes of the Environmental Technology Focus Group

Process and Summary

The Environmental Technology Focus Group was relatively large during the first session and included individuals representing various economic sectors, including large and small businesses, public interest groups, academia, the Federal government (both regulator and landlord), and state government. The group felt it was important to capture the diversity of opinion in this focus group. The process used was designed to promote discussion but also document the range of opinions.

The facilitator began by reading the question the session was to answer. Then the focus group had an open discussion, during which the facilitator wrote down major points as they were identified. The major points identified during the open discussion are provided below for each question. When discussion began to wane or time grew short, the facilitator asked the focus group to consider the proceeding discussion and record the factors they thought critical to the answer. The facilitator then asked each focus group participant to select the economic sector they represented and to rate the factors on the final list. The ratings, therefore, are grouped by economic sector; these lists of rated factors are provided in the Appendix. The reports made back to the Workshop as a whole reflected a summary of the rated factors.

The Environmental Technology Focus Group was much smaller during the sessions on the second day of the workshop, and the discussions ranged beyond the specific questions being answered to how the information generated would be used and whether the expectations of the participants had been met. Several focus group members felt that the workshop was the first opportunity they had had for open communication with the Federal government that was not driven by a crisis or review of a specific government action (like the public meeting to review an EIS). They appreciated the chance to provide input before decisions are made. On the other hand, several participants expressed disappointment in the one-way flow of information. They would have liked to have had feedback during the workshop on the information they were providing. All participants wanted to receive copies of the final report to the White House.

The first session began with an outline of the suggested process to be used and a short discussion of the process itself. The group accepted the process described above. A set of ground rules were agreed upon to promote fair exchange of ideas:

Ground Rules

- Its O.K. to disagree!
- All ideas are welcome!
- Honor time limits.
- Seek to understand other views.
- One speaker at a time, please.
- Constructive criticism—no attacks.

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The first question considered by the group was:

Question 1. "What obstacles are restricting the application of technologies for a sustainable development of natural resources?"

The following points were made during the general discussion:

- Most environmental regulations were not written with sustainable development in mind. Example: Title III of the Clean-Air Act. The laws drive the use or non-use of technologies for environmental compliance because if it can be done it is legally required. Consideration is not given to if it should be done.
- The "not in my backyard" syndrome. This attitude has resulted in a situation in which whole industries that are critical to our standard of living, such as the paper industry, not being able to get operating permits in the U.S. Even R&D permits to test new technologies are rejected to keep waste "out of my backyard."
- Environmental regulations that don't take into account multi-media effect. One regulatory requirement will make secondary streams more hazardous without consideration of the entire process as a system.
- We have been talking about a policy of sustainable development but there has been no change in the laws. Regulators don't consider sustainable development in either development of laws or in enforcement because sustainable development does not have a basis in U.S. law or in state law.
- There is no economic driver for sustainable development. Industry is looking at profits for the next quarter; not at possible profits 20 years from now.
- We should implement risk-based assessment and management. A lot of people talk about risk assessment and risk-based management, but no one is doing it. Planning and management need to consider the environmental benefits of technology usage as well as the economic benefits.
- There is little capital available for implementation of environmental technologies. The pay-back from implementation of environmental technologies is generally in the 5-10 year range; industry needs 1-2 year paybacks to obtain the necessary capital.
- The lack of "de minimis" standards prevents application of environmental technologies. We need to clearly define acceptable levels of hazard; now it is a guessing game. We need to know how clean is clean.
- There are no incentives for partnering between regulators and the regulated. EPA is measured by how many people they can convict.
- Small business needs better-defined, clearer information on "needs" for environmental technology from the DOE labs and other entities who will implement environmental technologies.

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- In many cases alternative technologies may exist, but it is regulatorily impossible to implement new technologies.
- It should be O.K. to change in midstream. Regulators discourage the use of adaptive management in resolving problems.
- Public perception can kill new environmental activities and new technologies.

Based on the open discussion, the focus group next developed the final list of obstacles/barriers, which is reproduced in Appendix B.

After rating the obstacles to use of environmental technologies, the focus group moved on to the second question.

Question 2. "What tools are needed to encourage sustainability?"

These points were made during the general discussion:

- We need tools to do economic analysis. We need to do economic analysis to support decisions. We need to recognize the interfaces.
- We need system integration tools that will incorporate regulatory, economic, societal, and technical factors into a prioritization process.
- Uniform review and enforcement of regulations.
- Adaptability to enforce regulations on an ad-hoc basis. Not all regulations fit all situations. The insistence on enforcement when the regulation is not appropriate discourages wise environmental decisions.
- We need an actual national or state policy (rules) for sustainability.

After the final list of tools was rated by the focus group, we joined the other breakout groups for progress reports. The recorder read the following list to the Workshop as a whole to summarize the obstacles encountered in trying to implement environmental technologies and the tools needed for sustainable development of natural resources.

- Our group had representatives from different economic sectors. Many times small business and larger businesses (industry) had different priorities and concerns. In general, the public interest groups, Federal employees and representatives from state government agreed with larger business about which obstacles were most important to the future use of environmental technologies.
- Implementation of environmental technology would be enhanced by improved communication and understanding by all participants in a decision. We need nonadversarial working relationships.

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- Multi-state permitting is not a barrier to technology use, but the fact that multiple agencies have jurisdiction over environmental activities is.
- "How clean is clean?" is a major concern to everyone but industry (large business). All economic sectors and all participants (technology developers, technology users, regulators, and the public) need information to make decisions.
- There is no incentive to consider sustainability in the current process.
- The "not in my backyard" syndrome is a concern to the public interest groups and Federal government, but was not considered to be a concern by small business, larger businesses, or state government.

The second day of breakout sessions began with a brief review of the first day's activities. The Environmental Technologies Focus Group wanted more discussion and idea exchange. Therefore, the open discussion portion of the session was increased and less emphasis was placed on trying to record, for the group to read, the factors being discussed until the final list was prepared. This resulted in more discussion between group members to clarify factors as they were being identified.

Question 3. "What role should be adopted by industry, the public, government, academia, etc. to encourage sustainable development of natural resources?"

The question generated a discussion on what "role" means. There was concern that by defining a role to a specific group you exclude participation. At the same time, it was noted that if you accept input from anyone, you are assuming that the input from all is of equal value or weight and that the received input is representative of the whole. This is the group recorder's list of factors mentioned during the open discussion.

- The group felt that the Federal government should set the broad goals on how things should be done and provide a lot less of the detailed "how to" in regulations. The end-user of an environmental technology should define the need and the "how to's."
- The group felt that the U.S. should have a policy that provides incentives for actions that promote sustainable development of resources, but could not agree on who should develop that policy.
- Government should guarantee loans (like the \$40 billion we are guaranteeing for Mexico) to assist smaller businesses in the implementation of environmental technologies.
- There must be an incentive to produce a new way of doing business. The most effective incentive is usually financial. Government should provide these incentives.
- The government must be cost conscious when they expend public funds (taxes) and they must be cost conscious when they require expenditure of business funds (environmental regulations). The public needs to demand government cost accountability and a clear statement of values.

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- Regulation drive the market for environmental technologies. Those regulations should be based on cost-benefit analyses. We should tell the government at both the state and Federal level what regulations are needed and how regulations should be implemented.
- Both risk analysis and cost-based analysis should be added to the decision process for development and enforcement of regulations.
- Risk communication and risk assessment is a state responsibility because the state government, by its very nature, is closer to the problems.
- Regulations should promote avoidance of environmental problems through incentives for actions which promote sustainable development. In this area the Federal government, as landlord and industrialist, should lead by example.
- Information needed for participation is not easily found or retrieved. Institutions with the responsibility for general dissemination reinvent the wheel frequently at taxpayer expense.
- We need to perform research for the public good (i.e., forests, mining). We all need to provide stewardship of our natural resources.
- We need to value natural resources in national economic models such as calculation of the GNP, and determining how much water is worth.
- There should be criminal and civil penalties for actions which squander resources. The impact of penalties, right now, is not comparable to the economic gain from resource depletion. Penalties are sometimes a disincentive to getting on with the work, e.g., clean-up.
- It is the role of government to set policy to encourage sustainable development and the development and implementation of environmental technologies.
- International initiatives come from the Federal government—They need to lead.
- There should be collaborative efforts by all sectors to develop methods to prioritize actions needed to encourage sustainable development. The methods should evaluate cost/benefit.
- The U.S. does not have a Technology Policy or a Sustainability Policy.
- Small businesses play the biggest role in innovation. They are the dreamers of ideas and the doers, but they need capital.
- Develop and implement tools. We're latent with technology, we need to get on with it.
- With regard to environmental technologies developed at the National Laboratories, such as those displayed at the workshop, we need market pull from industry, not push from the labs. Technologies should be developed to meet needs identified by industry.

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- Small businesses and industry generate the jobs that generate the income which is taxed to provide funding necessary to support a sustainable economy.
- Research and development of technologies should be market driven.
- Academia plays a role in providing user-friendly information to the public and other groups.
- Everyone has to drop elitist attitudes and share the work.
- There is a scarcity of engineering resources in the state of Idaho.
- Industry and academia can perform marketing for small business to help them get off the mark.
- The sectors we represent do not have separate identities. All sectors must trust each other and work together.
- The public must recognize that there is a risk in doing anything. And the public must accept risk.
- The public must accept both the risk and the financial burden of government activities (e.g., cleanups).
- If the public wants to be involved in environmental decisions, they should assume responsibility to be technically educated. What you read is what you know. If we are going to use risk assessment, all participants in the process need to understand what risk is and what the models do.
- The public needs to acknowledge that there is risk. Individuals worry about air pollution, but refuse to do their part in prevention; for example, people rip out emission control devices. The public has to participate in sustainability. Accepting all the costs that go along with it. If we want clean water, we have to change what we're doing now.

The roles identified by the focus group were assigned to each of the economic sectors. Those assignments and the ratings by sector are shown in the table in Appendix B. Fewer individuals attended the Environmental Technology Focus Group session on the second day.

The focus group went on to the fourth question.

Question 4. "What kind of institutional infrastructure is needed to support sustainable development of natural resources?"

The focus group considered a tiered infrastructure, but could not reach a consensus. From that point on the discussion was open. Specific ideas were captured on the charts below. Separate charts were not developed for this question. These ideas were rated by economic sector

in the same manner that the factors identified earlier were rated. The following notes provide detail to support the short statements in the table.

The group agreed that there should be a way of assessing the requirements of all regulations to develop a single set of requirements or specifications. The current conflicting regulations represents a negative infrastructure. The regulatory infrastructure should be streamlined. There was also agreement that in the U.S. there are two main systems—the congressional system and the legal system. These infrastructures seem to operate separately with respect to sustainable development. Policy and law are not working together. The Constitution does not recognize natural resources and the Federal government's role in providing stewardship is not spelled out. The group continued discussions along these lines and concluded that there is no policy around which to build an infrastructure. They agreed that popular democracy, which is more hands on, is better than orders from Washington, but they also felt that the country needs a guiding vision, a sense of what is right, from the top. The group suggested that Congress review environmental policy every four years.

The infrastructure needs that were identified for environmental technology development included funding incubators for small business and having larger businesses educate small business about tools like systems engineering through workshops.

Communication needs and access to information were repeated themes during the open discussion of infrastructure to support sustainable development. All libraries, (local, university, EPA) should be available to everyone. The National Laboratories should network their information systems to form a "brain trust" accessible to all economic sectors. Information exchange should be a given in government-supported activities but the information systems are not up to date. There was concern expressed about the protection of proprietary technical and business information if all data systems have open access. The group was reminded again that business is the engine that will provide the means to sustainable development and that business is competitive. Several group participants felt that the existing infrastructure could function well if it was funded. In particular, the government agencies with responsibility for our natural resources are not fully funded. The very resources are being put at risk because there's no one out there watching them.

Another area of agreement reached, even though academia was not represented in this session, was the value in joint ventures between universities and state government. The group felt that the state governments which provide funds to and are responsible for state universities don't optimize the use of the universities as major resources for sustainable state economies.

Prioritization of action and funding was discussed. The group agreed that the public needs to have a real voice in prioritization through two-way communication with policy makers and regulators. The two-way communication was identified as an infrastructure need regardless of final form. It was recognized that prioritization is a function of values and each participant in the session had different values. The following lists infrastructure concerns:

- Fund existing infrastructure so it functions
- Appropriate adequate \$ for agencies responsible for sustainable development

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- Industry mentoring of small business
- Constitutional Amendment for sustaining national resources
- State government and state universities should work together
- Databases should be publicly available
- Encourage and promote two-way dialogue
- Removal regulatory conflict
- Consistent regulations
- Streamline regulations
- Encourage incubators for small business
- Large business provide workshops for small business
- Every tax-supported library available to everyone
- Public access to national laboratories information networks
- Infrastructure needs national policy on sustainable development
- Clearly defined goals for sustainable development
- System needs user input
- Country needs vision of sustainable development
- New system of voter referendums for environmental issues

There was another break to report to the Workshop as a whole after rating the factors identified as concerns in building an infrastructure to support sustainable development. The Environmental Technology Focus Group recorder presented summary information on questions 3 and 4.

The third and last Environmental Technology Focus Group session started with consideration of question 5. The group was much smaller by this time, and the method of recording information was adjusted, since all economic sectors were no longer represented and the group energy level had dropped.

Question 5. "What kind of information is needed by all stakeholders (participants) to promote sustainable development of natural resources?"

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The first thing the group did was reject the term "stakeholders" and replace it with "participants." They then identified the information needs listed in Table 5. Only one list was developed from the open discussion. The needs were then categorized as

- A communications need
- A psychological or social need
- Involving technical, policy, or planning requirements
- Involving infrastructure, facilities, and information access needs.

The information from this exercise was presented to the Workshop as a whole in the format shown below.

Communications Needs:

- Information needs to be relevant to the audience, not boring.
- Technical information must be understood by the audience.
- We should minimize the trend toward too technical presentations in decisionmaking forums with broad participant representation.
- Open all relevant environmental information to all requesters. The requester should decide what he needs, not the provider.
- We need information to put risks in perspective.
- Anyone having an alternative solution should have the means to insert it into the environmental action decision process.
- Keep it simple—don't over-"technify."

Technical/Policy /Planning Needs:

- Information needs to be relevant to the audience, not boring.
- Minimize trend toward too-technical presentations.
- We need a lessons-learned system.
- Link current needs to future needs.
- Keep it simple, don't over-"technify."
- We need baseline plans and then program management plans to promote the sustainable development vision.

- We need information to put risk in perspective.
- We need information on all options related to a problem.

Infrastructure/Facilities/Information Access:

- Anyone with alternative solutions to a problem should have a mechanism to insert their solution into the decision process.
- No public document should reference an unavailable document.
- The public should be provided information on the location of resources.
- There are needs for hard economic data to support decisionmaking and a mechanism to communicate that data.
- Data, such as models and the geologic information system, should be available to everyone.
- The public should have easy access to pending legislation.

Psychological/Social:

- We need information to put risks in perspective.
- The public needs to assess community values.

Points made during the open discussion which are not evident from the table concern the Internet. Access to the Internet is available to universities and National Laboratories, and most large companies buy access. Smaller businesses and the non-computer owning public are left out. The old method of providing government data through university libraries had some advantages. Can the same public information repositories provide Internet access to everyone?

In a similar vein, the group found fault with the emphasis on high-tech solutions to all communications problems. One of the specific examples was the use of FAX machines to send invitations to meetings instead of using letters. Overnight mail is usually better than sending a document electronically that must be converted between word processing systems.

The group proceeded to consider question 6.

Question 6. "What should we do next?"

The group developed the following list, indicating what we (the public) should do, and what the White House should do.

What We Should Do

- Commitment to our own premises.
- Vote.

2. Focus Group Reports

- Partner more with others.
- Keep communications channels open.
- Be adaptive to do things differently
- Encourage public to ask for information, request mail.
- Be discriminating consumers in what we buy.
- Make a personnel commitment to sustainable development.
- Those of us who are technology and information providers should give the public what they want.
- Commit to more interactive policy dialogues
- We should get some feedback from all participants in the process.

What The White House Should Do

- Provide feedback. Tell us how this meeting integrates with other state meetings and how the information will be used.
- Listen.
- Provide structure for sustainability.
- The White House representative should report back to the participants of the meeting on how to implement the ideas developed and provide resources for implementation.
- If the White House wants information from the public, they should concentrate on understanding the details. Too much gets lost in the White House attempts to simplify problems. Focus on a single area of sustainable development in your next meeting.
- Continue to seek input from workshops such as this, before crisis meeting. This was a good first step—keep going toward more detail.
- Have focused, regionalized sessions directed toward industry component (e.g., mining in Denver). If focus must be broad, then meeting should talk about policy.

As with the other sessions, a report was made to the Workshop as a whole. The list above was read by the recorder.

3. Keynote Speakers

This section of the report contains keynote addresses given during general sessions of the workshop. These addresses helped to frame the agenda of the workshop within the broader context of the White House initiatives, and they also provided the perspectives of the State of Idaho, the Idaho National Engineering Laboratory, and the U.S. Department of Energy. Speakers included in this section are Phil Batt, Governor of the State of Idaho, John Wilcynski, Manager of DOE-ID, Dr. Tom Houlihan, White House Office of Science and Technology Policy, Susan Tierney, Assistant Secretary for Policy, U.S. Department of Energy, Bill Schutte, Director, Office of Demonstration, Testing, and Evaluation, DOE-HQ, James Hawkins, Department of Commerce, State of Idaho, and Barton Krawetz, Vice-President, Lockheed Idaho Technologies Company.

The Honorable Phil Batt, Governor of Idaho

I did just return last night from a trip to Washington to the National Governor's Conference, my first one. And as a new kid on the block, I was happy to partake in a very edifying process, but also to be struck with the grandeur of the circumstances and to feel very humble as a part of the process. I was able to visit, of course, with the president and vice president and all his cabinet. I also met with Majority Leader Bob Dole and Speaker Newt Gingrich, and some of the folks you see on the evening news taking it all down. And for a farm kid from Wilder, it's quite an experience. All the governors met, of course, and I met with all the western governors one day.

The theme among the governors and what's imputed as a great opportunity but also as a challenge was the increasing responsibility being devolved from Washington D.C. to the various states. There is no question what is going to occur at a very rapid rate. Instead of having all the categorical grants that we've had for so many years, we're going to probably end up with a few block grants in broad categories, with general federal guidelines, but to be administered by the states. This is going to affect us all in various ways, but it's probably going to affect the natural resource industries even more because some of these restrictions that have occurred on our industries, which I think both parties have agreed have been in excess, will be removed and left to the states in a fashion that we will try to get some relief from them. The governors are leery to this extent; they're also passing the balanced budget amendment back there and I'm all for it and I think that most of us are. But at the same time, if they give all the responsibility back to the states and perhaps not very much funding in order to balance the budget, it's going to be a difficult time for us to cope with some of these responsibilities. We're ready to do it. I'm sure by working together we can do a better job than has been done for us by the Federals; the states can do much better in my opinion. But it's going to be an entire change of circumstances and one which the governors are looking eagerly forward to, but with the reservations that they don't want to balance the budget on the backs of state tax increases.

I was able to visit with western senators and governors and particularly those in the northwest here concerning the impact of the Endangered Species Act on Idaho. The various difficulties it has brought to us (and I think there is no question the Congress) but what we're going to have some very substantial changes in the Endangered Species Act. It looked like the direction they were going was once again to give this responsibility to the states, to set some broad guidelines and have the states initiate their own plans for recovery of the species. And as long as they stayed within the federal broad guidelines, that would be acceptable. There were

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also some plans to completely scrap the Act or amend it seriously to consider economic impacts and the effect on human endeavors. Those I don't think have as much likelihood of passing, but they are considerations. There is no question in my mind, though, that we'll see a substantially different Endangered Species Act then we've been living under, and I think it's high time myself. There was much talk about the Clean Water Act, which passed the Senate several years ago 96 to nothing. Everybody agreed that we needed to do something about our water, and the Act has done a lot since then to clean up some of our water resources. It had resulted, as we all know, in many excesses. And the interpretations of it by the people (enforcers) who had to carry out the Act, in many cases, have not been practical where we have one locality matched against another, which had many different problems but the same set of criteria. So there was a bipartisan feeling (perhaps even voiced stronger by the Democrats) that they had to make some changes to make this a practical Act. They were in the process of that when the Republicans took over the Congress. I think we're going to see some very practical changes to that and to the Endangered Species Act and the salmon recovery and all these things that we're working on because of the tremendous impacts they have on our natural resource industries.

The judge in Hawaii the other day, as we all know, shut the entire state down, the northern half of it more or less, Central Idaho at least, by saying that the habitat for the salmon was endangered or being impinged upon by the activities of the miners and the others who were using the area, loggers, even the grazing people. And while we have a temporary stay to that order, I think we have to amend our statutes to the extent that we have reasonable application of these matters. Who am I to argue with the judge? Perhaps he has the proper evidence to rule the way he did, but basically, what he said was that one federal agency is not enough to talk to another on a timely basis, and therefore, we're going to take it out on the private sector. I think that those kind of excesses we have to put a stop to. And there's a general feeling in the Congress and among the governors (and I think the entire country) that we have to use some common sense in all these processes.

Well, in my young administration, which is now a month old tomorrow, has been beset by the question of nuclear waste, and it seems to engulf anything else that I do. I've attempted to use rational thinking in it to put my eye on the ultimate goal, which will alleviate these matters for all states, and that's the opening of a permanent repository or several repositories. And for that I have been criticized heavily. I'm going to resist as soundly as anyone else in this state and with every ounce of strength at my command, excessive waste put upon Idaho. But at the same time, I'm going to tell you as I've told everybody else, you can't wave a magic wand to answer the question and you can't let providence, opportunity, whatever it is, go away. We are 25th in the nation in the amount of nuclear waste that we have stored within our borders. This is not only Idaho's problem, and for us to say we're not going to play anymore, ship it somewhere else, it's not exactly going to work. We have to get these repositories open. I've made some positive steps in doing that in my young tenure here. I was able to get the commitment of both the Department of Energy and the Department of Defense to include the military waste in the Environmental Impact Statement for Yucca Mountain. It had not been in there before, and it will be because of my input. So I think I am doing some positive things. But I tell you, it's enveloping everything else I've done in my office. I have to have some resolutions somewhere.

Well, once again, I congratulate you on this conference, and I think balanced use of natural resources is in all of our interest in that we cannot operate without using these resources in the

manner that we've become accustomed to, and we just have to use some common sense in the use of them. I welcome you here and hope you have a good conference. Thank you.

John Wilcynski, Manager, Department of Energy, Idaho Operations Office

First, thank you Governor Batt for your willingness to represent the state and for the cooperative arrangement with the Department of Energy and the White House in organizing and conducting this conference. I would like say that I don't intend to take lightly the issues and emotions associated with the spent nuclear fuel issue. As a citizen or as a Department of Energy employee, I couldn't agree more with our governor that the real answer is in long-term disposal, and it has got to be in the context of the Idaho National Engineering Laboratory (INEL).

I'd like to give you a quick introduction of this institution (over the southeastern part of the state) as an enormous technical, regional, growing resource to solutions of some of the problems that we'll be talking about over the next couple of days. Like Governor Batt, I too am a relatively new kid on the block, having been appointed to this job in October. But I want to be a part of the aggressive forward-thinking technological solutions to the things that confront our society, and I believe I'm part of an institution that can do that.

Just by way of introduction, the Idaho National Engineering Laboratory is located on a very large geographic area, 890 square miles on the eastern side of the state. There are a number of facilities in Idaho Falls, but most of the activities take place in the desert to the west. It's the second largest employer of this state. It's the single largest economic entity, on an annual operating basis, in the State of Idaho: substantial amounts of procurement, collaborative arrangements, and collaborative responses to regional needs, such as the remediation problem that exists in Triumph or some of the problems farmers are facing (such as Mr. Hess, in southeastern Idaho). But we're in a very changing time, and it's probably an overused phrase that the only real constant in our lives is change.

Most assuredly, for a federally funded facility such as the INEL, there are national mandates that we must be responsive to. I'll discuss three of them. A couple of these have distinctive implications as to what we're here to talk about for the next two days. The first is a policy of the administration to leverage technology, and dollars spent on technology ventures in laboratories such as the INEL, in the interest of fueling economic growth. There are many people at this conference from the INEL, and I hope it will afford an opportunity for a broader constituency of the state and the region to realize the technical competence and the professionalism that to date as been largely focused on just federal missions. Not to belittle those federal missions, but the potential for a derived benefit through regional resources and regional economic opportunities is what it's all about. The second mandate is the enormous pressure on federal spending, and particularly with respect to that spending for discretionary things as distinguished from the federal budget for interest on the national debt or for the entitlement programs, and we're all hearing about those things as the Congress takes up the issues associated with the federal budget. And the last part has to do with the competitive economy.

I'm going to show you a mission statement for the INEL, and it speaks to a role, in respect, of trying to promote and be a part of economic growth. I have heard people say, "Well golly, you know a mission statement: You pick 50 words and rearrange them and by the time you're done

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you'll probably have a mission statement that will suit most any organization." This mission statement, in fact, does have a meaning to our institution, and as you see towards the end of it: "U.S. economic competitiveness." This administration brought the words of economic competitiveness to the mission statement of the Department of Energy, and it's never been there before. What that means is to use the talents and resources in places like the INEL for a broader role than just doing federal things. We must use those talents for their dual benefit, so as we advance in technology in chemical processes, or as we advance in technology in sensors we see the potential applications to agriculture, for example. By doing this, we will be following the mission statement. That's what this is about. So what we have over there is an engineering laboratory that in our mind has a great opportunity and great capability for bridging that gap between things that are a basic science or a basic research idea with the commercial application and jobs in commerce and economic sustenance. So that is a role that we would be good at and want to be a part of. But we can't do that role using our same old practices and our same old ways of doing business. We've been engaged over the last several years in an effort to redefine it, re-engineer that institution called the INEL.

In this graphic of a hopper, there are a number of different things that we've been doing in the last few years that are going into the top of that hopper, which are associated with contract consolidation and the competition of who's going to run that place, to economic models, to technology ventures, to establishing a quality culture of how we do it. But all in all, what we're attempting to be and what we will be is the lowest-cost, highest-output producer in the laboratory complexes of the Department of Energy. But one of the major mechanisms that we have, which will test the ideas of the U.S. industrial base and try to accomplish some of these things, was consolidation.

There used to be five major contractors that ran different pieces of the operation at the INEL. And what we began just about 3 years ago, that culminated on October 1st, was a competition of all comers in the U.S. industrial base to be the operating contractor to manage for the Department of Energy and, under contract to my office, the operation of the INEL. So we called that "consolidation" because we took five contracts and competed them and put them into one. The important point I think is that we didn't go out as a bunch of federal employees and say, "We are the government and we are very smart and we're going to prescribe to you as an industry just how we want this to look." We did just the opposite, and we went down and rented some space in the public library and we put everything we could find about what comprises the INEL, the missions, the work force, the mix, the organizations, the technologies, etc., for everyone to read, advertised in the Wall Street Journal, and said if you are entrepreneurial, innovative, want to challenge the status quo, we want to talk to you. We're interested in your ideas on how to take tenets such as cost efficiency, elimination of redundancy, integration of what we do, a whole new technology formula. In other words, leverage this technology for its greater good in terms of broader economic competitiveness. If you want to challenge the status quo, we want to talk to you and we want to entice you to bid on this contract. Well, Lockheed Idaho Technologies won that contract and began their work on October 1st of 1994, and it's going to be undergoing the transition for some time, because what we have agreed to here is a major change of how the Department of Energy does its business in Idaho.

Associated with this is a whole new economic model. But there are assumptions in this economic model, and the first is that the levels of federal spending for discretionary programs (such as the Department of Energy has) can't have a hope of sustaining their past levels; there's

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just too much pressure and too many competing forces ranging from balanced budget amendments to enormous growth in the entitlement programs that the federal government is funding.

But another assumption is that we must leverage these technologies that are going on in laboratories such as the INEL; in many respects, in economic terms, what the INEL has been is a consumed federal dollar rather than an invested federal dollar. And that's not to argue that our national security missions haven't been important and won't be important into the future. But they are more spending than they are investment. And we're trying to change that equation and be part of an investment. But we must get more cost effective. We must reduce our infrastructure, our costs, the way we've been doing business and, all in all, our cost; this economic competitiveness will help us take part in creating jobs and commerce as a region.

This slide showing the INEL with a lock on it may be a bit of an overstatement; it depicts the INEL as an island out there because it started as being very self-contained. We've been closed to a lot of dialogue, but over the last few years, that's been coming down. Economically, we've been pretty self-contained; all our infrastructure and a lot of our practice has been to make whatever we needed internally to our resources, and there's great economic opportunity to outsource and buy a lot of those things that we've previously done internally.

Where we see ourselves going is more along this line: remove the padlock, and collaborate with the industrial partners for things we can buy, ranging from treatment services in some of our mixed waste to simply buying some of the infrastructure support things that we need onsite. We don't need to make everything. Because the INEL is a fine engineering place, there's great opportunity to collaborate that engineering talent with basic science talent in the university structure up and down the corridor in the intermountain region. So what we're about is putting everything we do on the block and look at it and turn over brick by brick and find whether a past practice is still good or whether a new element has application. And there's economic realities associated with this that go back to the assumptions they talked about, there's great opportunity to take a look at what we do piece by piece.

So all in all, this economic model translates into something like this: We want to collaborate with regional university structures. Lockheed is going to bring in models that have been developed by MIT and help us create these associations with universities ranging from the University of Montana down through the state of Utah. But that's going to take a university and the basic science part in the states of Montana, Idaho, Utah, Wyoming, and others. Therefore, the collaboration of the research site with federal dollars for engineering programs is what we're about. And then we're spinning off these and we're buying things. We're creating things. We're leveraging the technology of what we do.

We didn't just start this, although October 1st is when Lockheed took over this contract. The contract consolidation became one of the major mechanisms for us to change and look for new directions. But leveraging the technology, looking for new business practices, learning about new economic models, really pushing ourselves for greater outputs, that's what we've been looking for. So again, this is what we believe to be a niche for this place called the INEL, and the opportunity that is created is to co-sponsor with the White House conferences such as this that open the dialogue with the region. What we have ahead of us over these next two days is a challenging opportunity. The dialogue is intended to catalyze a federal government role in

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facilitating innovation and stimulating a shift from incremental to technological transformation, for managing waste to sustaining and restoring the ecosystem, and from reacting to the environmental effects and public health threats to anticipating and preventing them.

The theme of this workshop is public/private partnership for sustainable use of natural resources. The INEL wants to work with this region and work with these communities. I believe the recommendation of this workshop can genuinely influence some of the thinking of longer economic growth, creation of jobs, and sustaining the environment. I'm pleased to be a part of it. I'm committed that our institution will be a part of it. Thank you.

Dr. Tom Houlihan, Office of Science and Technology Policy

I'm here today to talk to you about the process within which we are engaged: technology for a sustainable future, and that is essentially our framework for action. And we're going to talk today about environmental technology policy development both in the context within which the process is being developed and the federal structure that is being put in place to support the process. There are three context elements: history, demography, and the technology itself. As we take a look at the historical content, you look at an understanding of sustainable development that goes all the way back to 1970, the National Environmental Policy Act. As you can see, we're talking about working in productive harmony with the environment, so this is not just tree-hugging stuff, this is productive harmony, economics, and the environment. And the hope to the sustainable aspects of things are the economic requirements of present and future generations. Sustainable development since 1970 has been essentially the law of the land.

If we take a look at the demography aspects of things, there are two major impacts that come forth immediately. When we take a look at impending population growth, there are significant growth areas: Latin America, Southeast Asia; and we ourselves are going to be growing in population. In some of the same areas, the growth and global GNP, perhaps, will come up to a level where people will now not just consider their own lives but also the effects of their lives upon the environment. I think they will have enough money that they will be able to address the environmental issues. From an environmental technology point of view, we now take a look at the set of opportunities rather than the problem areas.

If we take a look at technology per se, we have to take a look at the present and future federal funding as we move from a remediation philosophy more toward an avoidance philosophy. Presently, we are spending on the order of \$4.1 billion in environmental research and development, spread across those policy areas. The first bar is an enormous \$2.8 billion; most of that comprises the monitoring activities of NASA on the earth. If we take a look at how this is split with regards to the taxonomy of the report (monitoring, pollution control, remediation, and pollution avoidance), there's the backdrop of major funding for NASA on the monitoring side, and then we see a movement toward an avoidance philosophy.

As we interact with the American public in workshops like this, one of the primary concerns that comes forth from an environmental technology development aspect is this funding gap that exists between benchtop and final commercialization of product. You as an entrepreneur have just proven your concept and you're ready to take on the world, so you talk to your favorite banker or favorite capitalist and what's the first question he asks? He doesn't ask you how good it is. What does it do better than anything else? His first question to you is who are your

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customers? You don't know who your customers are. You've just proven your concept. You've got to get wrapped up in title scale determinations, and then finally you've got into the commercialization stage. So the entrepreneur comes back to Uncle Sam, and Uncle Sam, because there is not an industrial policy, says I've taken you this far, you have to take yourself essentially across this valley of death. So one of the primary determinations that we are making in this next thrust for development of environmental technologies is trying to have the private sector respond to a supportive aspect across from the proof of concept, through the pilot stage, to the final product commercialization. You now walk into the federal structure that is put into place to support these ideas.

Finally, the environment is one of the nine primary considerations of the new National Science and Technology Council (NSTC). NSTC has now put the environment and the natural resource concerns at the very top level equivalent to national security concerns equivalent to the national economic council because now NSTC has as its chair the Commander in Chief. These are the primary agencies and the departments that are involved in the National Science and Technology Council all the way from agriculture through the arms control disarmament agency to the Office of Management and Budget. This is the way that all of the budget determinations are being considered within the United States government. Chief among these nine primary determinations, for our purposes, is the committee for environmental and natural resources. That committee is now broken down into the fundamentals with regards to environment and natural resources: air, water, toxics, etc.

In addition, there are three cross-cutting subcommittees: one on social and economic research, one with regards to technology, and finally, that which is most popular on the hill today, risk assessment. Now notice where risk assessment appears in this breakout. It appears after all the determinations are made on a scientific basis and finally before it goes into policy and determination. Industry has an effective input to the NSTC through the president's committee of advisors in science and technology. The breakout is nine academics: seven industry and two nongovernmental organizations, and the details are as follows. Notice that the chairs are on the government side: the science advisor to the president, Dr. Gibbons; from industry, a very respected individual, John Young, former president of Hewlett Packard. Academics are from Cal-Tech, University of California, and MIT labor. This is a total of 18 folks that have been particularly successful in research, in industry, large and small, and in teaching. These are the people that are having a prime input in NSTC.

In regards to the processes within which we are engaged, we're looking at 10 policy areas. In each policy area, we're asked to provide the questions, Where are we now? What direction should we take toward the future as we move from a remediation philosophy to a pollution avoidance philosophy? And what are some of the possible next steps that we will put forth as federal partners in this partnership? That is what you're considering today, and you're building upon those because we also need your inputs with regards to the possible next steps of private industry. The 10 policy areas cover the full spectrum from R&D demonstration, which is particularly applicable to our technology; market stimulation, both domestic and foreign; fiscal matters (taxing policies, etc.); international congress and foreign aide, then finally the big three: education and training, information dissemination (utilization of the national information infrastructure), and the one that we are very deeply involved, partnerships. So effectively, beginning last July when it was released by Vice President Gore, until April 22nd, 1995, we're looking at inputs from the private sector with regards to all of these policy areas in an attempt to

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facilitate the innovation, encourage new approaches, and engage everyone in the process and learn how to work together. The White House Conference happened in the second week of December; 1,200 folks gathered under the leadership of Vice President Gore, and there was an enormous interchange of ideas, good, bad, and indifferent, with respect to all of the major policy areas.

Again, you are going to have an equal opportunity to have your inputs felt regardless of the strategy. If there is a need for your further participation, which we hope there is, the full report is available in addition to the executive summary that you have: 1-800 Env, ext. 6676. The phone and the fax are directly to the Office of Science and Technology Policy, and we also have an internet address for your comments. So what I want to end up with is to encourage again, as I'm sure is happening, a free flow of ideas because we look upon you as very important partners in this whole endeavor. Thank you again.

Susan Tierney, Assistant Secretary for Policy, U.S. Department of Energy

It's actually convenient that Tom was the person you put right before me because I'd like to jump off a platform that he talked about. That platform being what the Clinton administration is trying to do to get technology and research and development moving forward to help the U.S. become competitive, to work in a global marketplace where our being on the cutting edge is important, not just for our scientific stature but for our economic survival. We've known that that's been the case in our national defense area. Those of you who have long been affiliated with the Idaho National Engineering Laboratory know about that important national defense mission. Right now, we talk about national defense in different terms, terms more akin to the sustainable development, economic competitiveness, environmental quality issues that we've been hearing about. And I want to just follow on a theme that Tom talked about, and that was technology versus sustainable development. Technology is the operative term in my remarks today. And I want you to think about it in terms of sustainable development. The key thing about technology for sustainable development is investment. And investment strategy is opposed to a consumption strategy, and that's where technology fits in, building into our tool kit the ability to take advantage of not only our resources today but enable tomorrow's generations to do the same. Teaching the investment strategy is tough. The United States, our statistics on being investors, do not position us well internationally. There are other countries where an investment strategy is part of the way that people live their lives. And the technology for sustainable development is part of this investment strategy: building a capability so that we don't have to use as much to be as productive as we want, and by using our money, and not just dollars, but again the natural resources that you've been hearing about this morning.

You've heard about the different aspects of natural resource use that are part of the sustainable development picture: mining, water use, energy use, and the environmental impacts of those things. Potato processing used a lot of energy and mining to get the fuels that people use for energy, and energy is unfortunately one of the things that most contributes to the pollution portfolio that we have, that we are now dealing with as a country. Much of this pollution is derived from the combustion of fossil fuels. So energy use is one of our biggest challenges as we think about how to get those resources used much more effectively in terms of their productivity, without getting so much pollution out the other end.

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The thing that I want to focus your attention on is that useful work portion: the dollar that you use to spend for energy and the productivity that you get out of it, and your pollution costs that you're left over with. We've made huge improvements, in the United States in the last 20 years. Our use of energy was climbing up until the oil crunch and then it dropped down, and it's climbing up again. One of the things that happened in that is that we are getting much more bang out of our energy dollars these days. We used to have a relationship between energy and the lack of energy use per dollar of gross national product. And it used to go hand in hand. We are getting much more keen in terms of our energy use and its relationship with the gross domestic product. But you can see we have a huge opportunity in terms of efficiency gains moving forward.

You know you've heard much today about the challenge associated with that opportunity. Again, here's some more information about the challenge. When we spend money on fuel to get products and goods and services, we also have to spend money on cleanup. Two percent of our gross domestic product today is spent on pollution cleanup, waste handling. Imagine in your own household if your trash bill were 2% of your income. In fact, it is. It's just built into all the products that you pay for today in terms of paper products and water and everything else. We have the ability to avoid that by using energy much more efficiently.

A story that you hear about all the time on the news is that many other firms are now selling goods and services into markets where they have competitors whose production costs are much lower and they can beat us; therefore, on their ability to produce, they can beat us. The rest of the world has another aspect in terms of world global competitiveness that is an opportunity. I just talked about the challenge in terms of it: they are cheaper to produce on many, many goods and services. I think we've heard about that in timber and paper business this morning. But there's something else going on that's a real opportunity for sales production, and that's on the energy and environmental marketplaces globally. Clearly, the U.S. has an edge in terms of the products that we produce. What you see up here are charts that show the expected amount of electric-generated capacity that will be built in various countries over the next decade. There is great reasoning in India, China, Pakistan, Thailand, and south Asia that in order to get their productivity going, they have to do their energy business differently. India, which is three and one half times the size of the United States in terms of population, has one-fourth the electric-generating capacity today as we have. So there's almost a one-sixteenth difference there in terms of their being wired. They know that in order to drive their energy and economic growth, they have to bring in new technology, and they have to get it through some capital resources that they don't have today. They're opening up their markets that have been closed to foreign participation for the last four decades. Like India, other countries like China, Indonesia, and Pakistan are also interested in advanced technology, and the U.S. is well positioned. And they're interested in U.S. capital to come to the marketplace in terms of investment. And so one of the things that we think about is not only making it possible for our companies to do business there, part of this technology for sustainable development is to give opportunities to these countries to not take the same old business approach in terms of generating the pollution that we have experienced in the United States. You give them technology that is cost effective and clean.

My boss, Secretary Hazel O'Leary, has an agenda of visiting the bigger merchant markets, principally in south Asia, and moving on a sustainable development portfolio. This gives them an opportunity to see the array of technologies that U.S. firms have advanced and to talk with them about the cost-effective benefits associated with those. Also, we talk about the ways in which

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those advanced technologies can work economically for those countries, and we're finding great success. I should say, we're finding great success in a very difficult world. And the difficulty just has to do with today's poverty in those countries. But as they move forward with their bursting population, they cannot, they will not have any choice. Today, the air in India is so dirty that you can't see through it. It's much worse than Los Angeles on just about every day of the year. So as they add continually to that population and continue to add generating sources and they experience the economic growth that we expect, we think we're well positioned to offer technologies into that marketplace.

Additionally, in much of that world marketplace, there is the other aspect of the environmental agenda. I want to remind you about the water supply technology approaches and the water quality approaches, not just the air pollution approaches that are, by and large, what people are talking about when they talk about clean energy technologies. U.S. companies in the environmental technology business are a booming industry. They've begun to coalesce as an industry itself, now about 30,000 companies. I know that here in Idaho you're hoping that this will be one of the spinoff, nurturing industries that you've brought in here, and I hope that the Idaho National Engineering Laboratory is helpful in moving that market forward in terms of the interdepartmental technology marketplace.

Our strategy, again, is an investment portfolio, moving technology and matching it with business need where there are environmental improvements to be had. I'm going to mention three cases, and all three have to do with avoiding pollution. First, energy efficiency in the lighting ballasts. This has been a major area of work over the last decade by the Department of Energy, and it's now moving into marketplaces. This is one of the technologies that we are also taking abroad, and U.S. firms are the leaders worldwide in terms of these highly efficient ballasts. Lighting is one of the major sources of uses in all those buildings that you saw that represent one-third of the energy use in the country. So to the extent that we can have lighting much more efficient and get more output, more lumens out of every piece of BTU that you burn, we're better off.

Another case is about supporting wind-driven technology where we are trying to use much of the known power in the Department of Energy laboratories around the country, including the National Renewable Energy Laboratory in Denver, and match that with problems in the utility industry. We try to solve problems and look for opportunities by mapping where wind resources exist, testing turbines for super efficiency, and looking at manufacturing techniques that will drop the production costs down so that wind resources and wind turbines are cost effective. Wind technology is a great one in remote areas, especially in Asia, where they have to wire a very long distance.

Finally, let me tell you about one of my personal favorites, the partnership for a new generation of vehicle. This is a pollution avoidance strategy: this is government bringing its resources to bear, bringing taxpayer resources to bear (in the form of paying for research and development), bundled for the Department of Energy, for NASA, for the Department of Commerce and Transportation, that supports scientists and engineers and matches them with scientists and engineers from the Big Three auto manufacturers. We have a problem: we're driving our cars more and more. However, oil is cheaper than it has ever been in terms of your pocketbooks. But it's cheaper than it's been in 20 years. You already heard that we're past our oil import threshold that we were 20 years ago. And we have most of the driving factors in

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energy use, and our increasing dependence on imports is associated with automobile driving. Congestion is also happening. But also ground-level pollution and greenhouse gas emissions are being driven by our increasing use of automobiles. One of the first things that Vice President Gore and the science advisor, Jack Gibbons, did when they came on board two years ago was to see that we've got these social problems, and by social, we have this national defense issue associated with the rise of oil imports. We have congestion. We have air quality problems. Why can't we match that national need in the same way we get a moon shot kind of challenge? We use the national need, which is to solve this fuel economy issue, avoiding pollution, getting more productivity out of every gasoline gallon that you use. But bring the know-how and the good customer knowledge of the automobile industry and match them together. This partnership works the following way after it was agreed to a year and a half ago: a team of engineers from government and business, from the Big Three, and from various agencies and governments, sat down to do a research portfolio to identify what they needed to work on in terms of materials, in terms of testing and diagnostics equipment, in terms of manufacturing line productivity improvements, in terms of a better fuel combustion, and to look at that portfolio to see where you could get the good investment to get productivity in the automobile. The goal was to see whether or not we could design an automobile that got 80 miles to the gallon, which is three times today's fuel economy, but was just the same in terms of what customers want: performance (out of the stop sign), size (I think their plan for a Ford Taurus type of automobile), and the distance that you can drive the car. These are all of the performance requirements that the American public demands in showrooms. This other national need is greater fuel economy, so we have the research and development investment strategy to see if we can lick this problem. The national labs are key players here because of the expertise they've derived from other missions and because they're applying it to these other national needs. That's what we think a partnership is all about, and I know that the INEL has a piece of this partnership. So let me just close by saying that the sustainable energy policy approach is one that we think is a no-brainer, except it's difficult. This investment strategy is critical to our long-term competitiveness for our economic health and our environmental health.

The Department of Energy considers this as part of its varied mission. The Secretary's mission statement reminds us of bringing the nation's technical and scientific assets—and by that she means the scientists and engineers that we have here in Idaho and in other parts of the country—and helping them not only work on the national security problems in the traditional, basic energy problems we've worked on, but on these other technology challenges we need for our U.S. health. Thank you.

Bill Schutte, Director, Office of Demonstration, Testing, and Evaluation, U.S. Department of Energy

Good morning, I'm very happy to be here. I'm certainly impressed with the work that you have already accomplished in your break out sessions yesterday. You really looked like you were working as a team and I think you have definitely identified common tools and common barriers. Those barriers that you've identified are definitely real barriers.

I am speaking for the Office of Environmental Management, and environmental management is a relatively large organization. Its budget is about \$6 billion. It actually supports over 60,000 FTE, or full time equivalent people. In the Office of Technology Development, we

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have over 5,000 scientists and engineers working on developing technologies that will solve the environmental problems of today and of the future.

For some reason I've always found Groundhog Day to be an excellent occasion for discussing our environmental management program in DOE, mostly because I'm reminded of implementing emerging environmental technologies that decrease costs, decrease risk to the public, environment, and workers, or accomplish something that has not been done. I just received an on-the-scene report from Washington D.C. that the famous groundhog, Potomac Phil, emerged this morning from deep within the national deficit. And according to my eyewitnesses, even though he had a fever, he actually saw his shadow. Unfortunately that means implementation won't happen for another 6 years, unless your efforts shine the light directly over Potomac Phil and wipe out his shadow. And this is critical for economic competitiveness and sustaining a quality environment.

I feel both honored and also right at home in a state which has over the years assumed such a prominent role in the research and development of environmental technologies. It is also extremely heartening to see how Governor Batt has assumed the reins of leadership in Idaho, is making the kind of vital decisions which will certainly strengthen Idaho's future, especially as they deal with science and technology.

I want to tell you how seriously our folks at the Idaho National Engineering Lab are taking the administration change of reinventing itself. INEL's entire focus has shifted to technology development with a systems engineering approach to cleanup and waste management challenges, where tightening budgets demand innovation and flexibility in order to meet compliance agreements. The next step in the cleanup program is to begin to tackle the biggest cleanup concern at the site, buried transuranic waste at the Radioactive Waste Management Complex. During our visit to INEL in October, Secretary O'Leary announced the award of the contract to Lockheed Environmental Systems and Technology to remove buried waste from Pit 9. This fixed price contract is unique in the sense that it places risk for performance on the contractor. In addition to developing new contracting approaches to waste management and cleanup, INEL is also the lead engineering lab for new technologies. In fact, INEL is the applied engineering laboratory for the entire DOE complex and not just in cleanup technologies.

Not just a society, not just as a hemisphere, but as a part of a science and policy-making species, we will choose one of two paths for our planet and hence for ourselves. If we can base our environmental decisions on something approaching the seven generation look-ahead-for-skies, a native American tradition, we'll make the right choices. The United States of America has trouble looking ahead seven generations. We're not much older than that. But the other Americas and most of the non-Americas are old enough and I hope wise, persuasive, and persistent enough to prescribe the right corrective lens for our country's adolescent short-sightedness.

When Chairman Mao was asked what he thought of the French Revolution, he answered that "it was a bit too soon to tell." What would Mao have said about the American Revolution. What I have to say in behalf of the White House initiative on technology for a sustainable future is that we need and intend to start a new American revolution based on a determination to focus as partners on what we value, our world, given to us as stewards and trustees. Whether we like it or not, the future is in our hands. We must move not in degree but in kind from a mind set of

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remediating toxic hazardous waste to controlling, monitoring, assessing, and preventing it. Humans may be the measure of all things, but, in today's technology arena, things to measure with the measure of scientific and technical men and women. We need better measures of many kinds, legal, regulatory, and technical. Science soft and well as science hard. And that's what this White House initiative is all about. Slowly, but surely, and not without your help, we shall move from emphasizing remediation to emphasizing avoidance.

Let me talk to you a moment about the meaning of "business as usual" in our shop: as usual, we're living in it, a fish bowl. Our activities have attention from all quarters. A recent report by the U.S. General Accounting Office stated that the Department of Energy has failed to tap into innovative technologies for cleanup of the nation's nuclear weapons production complex, despite a substantial amount of resources being spent to test new and emerging technologies. One of the most significant effects of this report was to put the spotlight on our program. The role of DOE Office of Technology and Development, said GAO, is a key to successful use of innovative technologies. The Galvin report basically follows this same theme. Assistant Secretary Tom Grumbley noted in his September 1994 letter to the editor of The New York Times, "while we acknowledge barriers to using innovative technologies at our site, we have implemented a new management strategy to focus on those pressing needs of our program. We are working with regulators to achieve greater acceptance of new and innovative technologies and we are coordinating technology development activities with agencies such as the Environmental Protection Agency and the Department of Defense in order to maximize benefits and reduce costs." The overall strategy that Mr. Grumbley refers to is that of focusing the technology development program on the department's major environmental management problems while involving the best talent in the DOE and the nation, both public and private, science and engineering communities.

There are four major problems for the Department of Energy:

1. **Mixed waste.** In the Department of Energy we have over 1 million 55-gallon barrels of mixed waste, and are retrievable if they are stacked on pads and maybe in buildings. Mixed waste basically is any waste that has a hazardous component (can be inorganic or organic) and a radioactive component. Some of this mixed waste is as simple as booties that have been contaminated with plutonium. It could be kitty litter that was used to pick up a cutting fluid that had plutonium in it, which they put in baggies and then put in a 55-gallon barrel. And we've been storing that for over 50 years. By the way, to characterize one 55-gallon barrel, the cost is between \$100,000 and \$500,000 a barrel. This is a major problem.
2. **High-level waste.** High-level waste tanks are now managed by the Department of Energy. When we were in the production of nuclear fuels, they would take a fuel rod, which is probably 20 ft long and about 1/2-inch in diameter, just a metal rod that had originally uranium 235 and uranium 238. It was irradiated for a period of time and would produce plutonium 239 and uranium 239. They would take these rods, dip them in nitric acid, chemically extract the plutonium and uranium, and then they would end up with daughter products in a nitric acid solution. This was a large operation. They would neutralize that with sodium hydroxide and then put it in tanks. Now these tanks are relatively large: they are 500,000 to a million gallons. We have over 300 of these tanks containing high-level radioactive waste. Then we actually ran out of tank space,

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so we evaporated some of the water and put the soft slurry back in these tanks. And if you're familiar with Hanford, we have a number of tanks that will have soft slurries, and there will be a temperature profile in them and you'll end up with salt cake or hard salt crusts on the surface. That is a focus area. There are all kinds of problems and needs for technology, for retrieving, treating, and characterizing this particular waste.

3. **Contaminant plumes.** Contaminant plumes are a contaminated ground water and contaminated soil. A contaminant can be carbon tetrachloride, which is used as a solvent for a period of time. We have trichloroethylene (which they sometimes refer to as TCE), which is used as a solvent. Plus they have chromate plumes which are inorganic lead plumes, mercury plumes, throughout the Department of Energy. Some of these plumes are relatively large and they can be two-phased, meaning there can be a water (aqueous) phase and an organic phase. There's a carbon tetrachloride plume at Hanford, which is about one mile wide and five miles long and relatively deep. And there are TCE plumes throughout the weapons complex. So we have the Contaminant Plume Containment in Remediation focus group. Within that focus group, there will be over 30 technologies that will be demonstrated in FY 1995.
4. **Contaminated facilities.** We also have facilities that have been contaminated in the past because of the activity, or they're just old and need to be taken down. Right now, there's over 5,000 buildings or facilities that have to be decontaminated and decommissioned. There are radioactive materials in the concrete, within the floors, on the inner surfaces. Some of these facilities will have been used for production and shutdown, so the contaminants and pipes and all kinds of equipment. We have a focus area of looking at unique, innovative ways of decontaminating and decommissioning facilities.

We also have 3 cross-cutting groups. Cross-cutting groups are really programs that develop technologies for each one or more of the focus groups. These cross-cutting groups are robotics, characterization, and efficient separations.

Robotics is a very active program. As a matter of fact, INEL even participated in a portion of the robotics program; it's represented in the display. The robotics program is really focused on developing common software and common hardware so you can actually put these robots together and don't have to continually buy different software to run a particular robot. They've done some clever things in the robotics program. If you've ever seen a ball at the end of crane and as the crane moves around, the ball swings. The robotic program can actually take a wrecking ball on a crane and move it rapidly without the swing as long as you accelerate and decelerate with momentum. That precision is required if you're going to put robots in tanks for D&D. From the focus on the precision of putting a very long (50-ft) arm into a tank, eye surgeons have looked at that particular technology and would like to use it and have signed a CRADA for eye surgery. It has also been transferred to plastic surgery.

We also have a cross-cutting program in characterization, which is a very aggressive program.

We also have a cross-cutting program in efficient separations. In efficient separations, they're producing very clever, high volume flow through chelating complexes. They can remove cesium and I think you probably saw the booth in the display here. We are now coordinating all

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these activities between EM30, which is waste management, and EM40, which is environmental remediation. We're also coordinating with other federal agencies to decrease duplication relative to these particular activities.

Let me say, as I near the end of my remarks, there is no such thing as a democratic science or a republican science. Science means knowing. It's both the body of presumed knowledge and a method for revising and adding to that body. Here in summary, are things beyond politics that we need to know more about and know how to know more about. What are the urgent risks in our system and why do we call them urgent? Why do we call them risks? Who needs to believe us? How can we communicate so as to be believed? And what actions should follow from these convictions? And what is communication? How much money is it smart to invest in environmental technologies and systems for maximum public benefit? What do we mean by smart? What do we mean by benefit? And how can we communicate those meanings so we'll be appropriately funded? How do we work with the state and local regulators in industry to see to it that what we can get out of all this is a new economic machine? In the words of the White House initiative, how do we develop and implement technologies for a sustainable future, not just technologies that cleanup, comply, and go out of business. Like most important questions, these have no answers in closed form. Yet because they are important, we in the Department are called on for answers every day. Prediction is obviously difficult especially when it concerns the future. I nevertheless predict that thanks to the help you and your colleagues provide in focusing on the obstacles and the tools to overcome, this decade will someday be seen as having marked a turning point in relevance, quality, effectiveness, and efficiency of environmental monitoring on behalf of sustaining a future for all of us.

James Hawkins, Director, State of Idaho, Department of Commerce

Welcome here and welcome to all of you from out of the State of Idaho. I want to reaffirm with you that I am excited about the opportunities that exist for the state of Idaho as it pertains to the development of service and technology for sustainable use of natural resources. We must bring together the public and private interests, not only within the state of Idaho, but also out of the state, and the federal government as well, such as we're doing here today. This is a group of people that can make things happen, and we all need to look towards a common goal: to understand that maintaining and enhancing our environment does not and should not be in conflict with economic development. They can and should compliment each other. That's what we're doing in the state of Idaho and I think our sisters states are doing the same and probably all over the country.

But we must start today doing something, rather than just talking. I've spent 8-1/2 years in this job and all we do is go to conferences and talk. Now that isn't our management style in the Department of Commerce and it's time that we start making things happen. And again, let's now take action after this conference, be held accountable for what we say we're going to do; it's time to do it.

I've had the pleasure of working with several INEL Site managers over the last 8 years and now with John Wilcynski. And we can work together to meet the demands of the new DOE/Lockheed contract. As President of Lockheed of Idaho, Jon Denson is focused on the conversion of INEL activities from public to the private sector, and this will create private sector jobs in Idaho. I have spent a lot of time together with both John Wilcynski and Jon Denson to

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determine how this is going to happen. So let's get together and create jobs in our state and in our region. Let's start walking the talk.

The Idaho Department of Commerce has made a written commitment with the Site to be their partner in technology development. When we get into these things we put them in writing. In fact we've entered into an Idaho Technology Partnership with the Governor's office. In this partnership are the Governor's office, Commerce Department, State Board of Education, Vocational Education, the three major universities in the state, Idaho Association of Commerce and Industry, Small Business Development Center, and the Idaho National Engineering Laboratory. And we're going to develop technology. We're going to work in the manufacturing industry or wherever. But again, it's time to take action. And I'm waiting, let's go to work.

I must inform you that Idaho ranks dead last in funding for technology development in the United States, from general fund dollars. That's an embarrassment because I'm going to show you where we rank first in some things. Karl Tueller on our staff has spent a great deal of time going to Washington D.C. and meetings and working with Ann Rydall and others, and without any financial support. There's no commitment unless a check is written. And it's time that the state of Idaho put up some money. We asked for it but it's not coming about. In fact the state that ranks 49th puts 1 million dollars into science and technology development. It's time for the state of Idaho to do this and make that commitment.

It's important to develop these markets. We have Dick Johnson of our staff who works in the greater Idaho Falls net region to assist in this effort. And we devote more than half of his time and a great deal of my time to the INEL locations and with Lockheed, and it will be more so in the future.

Markets for environmental technologies are shaped, stimulated, and at times inhibited by environmental regulations. The United States has the most stringent regulatory compliance framework in the world, which has resulted in strong comprehensive environmental protection programs. As we look to the future, we must find ways to increase the flexibility of our regulatory structure so that it functions to encourage greater innovation. That is being addressed in Washington D.C. now so that we have a truly balanced, down-the-middle approach to developing these technologies.

We have successfully worked with companies coming in to our state, to handle cleanup activities and to bring in clean technologies. We focus in that area. Here's Lockheed coming in here and they are committed to environmental restoration and cleanup. Pit 9 is one project that's coming on and that's going to be going on for some time. And so we have reduced the reliance of Idaho and the Idaho Falls area on the Idaho National Engineering Laboratory and the contractors so that more business is done in the private sector.

Diversification is the key to economic growth. I'll give you another example of a company that came into the state from Concord, California about 6 years ago. It's called Limneon, and they're in the field of limnology: cleaning up our river and lake beds in our state, and the circulation and recirculation of water. And we think it's an exciting company. And there are some incredible contracts coming about. But that is where an Idaho company can help clean up some of our problems, where an Idaho company can be a leader. Diversification has and is critical to our state's future. That was the focus that we started in years ago. That was the

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message that we heard in the field. And that is how businesses survive and states survive, diversification. The Idaho Department of Commerce has worked with communities and industries to generate economic growth, a shift in consumption of resources to invest in new plants and equipment, creating added-value jobs such as Micron. Consider their potential expansion: they had 300 applications from around the world, 40 from other countries for their next expansion. Clean technology, exciting technology, viable technology, viable business. We have a plastics company that has been in this community for some time. They're going all over the world. We have diversification in the office furniture business in our state today, and Zialog in the processors business.

The big companies such as I have mentioned are the ones that you read about in the paper. But let me tell you, our concentration is on small to medium-size companies. And you don't read about them in the paper. In 1978 Micron had 4 employees. Suppose that we had ignored them, where would they be today. We pay attention to the people with 4 employees and that's where our concentration is because there will be another Micron, there will be another HP, there will be another Zialog in the state of Idaho sitting out there today. And I think there's some sitting in the labs ready to go in Idaho Falls today. And that's where we want to see the companies move: from 2 employees to 4 to 10.

What have been the results in the State of Idaho since these programs started 8 years ago? We concentrate, as you might guess, in our agricultural department area, and we work very, very hard in exporting their goods. We have some very exciting agricultural products and everybody mentioned potatoes, everywhere all over the world they talk about potatoes. But I'll tell you about something exciting: the manufacturing business in the state of Idaho, taken as a total, equals agriculture in the State. In nonagriculture employment growth since 1987, we were in number 2 in the United States, growing 35%. In manufacturing employment, we're number 3 in the United States, for a 30% growth since 1987. High tech employment is up 90% and will exceed over 13,000 jobs this year, and is growing. If the Micron expansion stays in Idaho, you can add another 10% to that figure. In construction growth, we were number 1 in the United States. High interest rates will affect that, and it will affect everybody around the United States, but ours has been growing at a steady pace from \$400 million a year to \$1.7 billion this year. That will go down someday, but I don't know when, we don't see it in the near future. Lodging sales and tourism have doubled in 7 years. It's part of the diversification, part of what we're talking about and I'll mention why. We're number 1 in nonagriculture exports, and we have five people working in our international division, working with companies all over the state. We started a little division at the end of 1987, when we had \$332 million in exports around the world in nonagriculture. This year we will do 1.4 billion. We rank number 1 in the United States in percentage of growth and received the E award this year from the U.S. Department of Commerce, the export award. That's not my award. That's your award here in the state of Idaho and the business's award and the state's award.

Technologies available from the INEL and elsewhere in Idaho could be a major asset for companies in Idaho and neighboring states in the international market efforts. Clean technologies are really in demand all over the world. We have an office in Taipei, Taiwan. I wish we had the companies to meet the demand. The opportunities are there and the money is there: about \$90 billion excess; they're ready to go. And we're working there, and our growth has been ten-fold in Taiwan since we've been there. Then look at Japan, Korea, Singapore, Indonesia. It's multibillions of dollars. So our markets aren't next door. They're all around the world. Sitting in

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the state government is very tough for me, having spent 26 or 27 years in the private sector, where if you did a good job the bottom line was there with a bonus. My ego is my bonus today and I'm very pleased and happy about what's happening. But in business, if I were out there with that technology and had the resources that we need, it would be very exciting living in a state that continues to grow as it is.

But again, the international environmental opportunities are endless. In major developing economies elsewhere, such as Mexico, we just opened an office in Guadalajara in the State of Palisco. Granted, there are some problems with the exchange of the peso and the dollar today. That will subside and will come back to normalcy. I can explain the first trip: I took 8 companies down to Palisco in October, and these people came back shaking their heads to the point where two of them are probably establishing additional expansion in Guadalajara. Hewlett Packard is a major employer here and they have a company there also, a plant with 320 employees. And what do they do there? Research and development, exciting development, and there's a lot goods going back and forth between Idaho and Guadalajara today. We'll see that expand to Brazil and Argentina.

We're not lacking for technologies. What we need along with some directed focuses, is some finances, venture capital, some aggressive banking techniques. We also need to bring together the people that are putting up the money and the people who have worked so hard in the labs to develop these technologies. We need to bring them in and hopefully they will. So Idaho has a strong commitment to protecting Idaho's quality of life, our environment, while continuing strong economic growth within the state of Idaho. The state of Idaho targets and supports clean industry. To me, what is one person's garbage has got to be somebody else's gold. I'm not a chemist or a scientist but it's got to be there. Cleanup of water and air contamination opportunities are here. I even sat on a committee here on waste tire recycling. There are some new technologies coming out now that can convert tires into 26 quarts of oil and steel and resell it back. Now you're tearing up your tire and putting it into highways or into floor mats, but now you can reuse the oil back into another tire. That's the key, recapturing the oil and the steel that's there. So those are the kinds of things we're working on that we get excited about.

True, as was mentioned earlier, if we don't take care of ourselves, we're not going to have any tourists here. We have to be careful that we aren't tearing up things, but we're keeping the quality of life and our tourism with us because we're growing at 11% a year right now. And we have to keep our parks and our water and our land, it's extremely important for that industry.

I have to tell you that in spite of the reduction of 1,250 people at the INEL, they're going to come back because we're going to move those businesses back into the private sector and expand beyond that. That's a commitment we can all work on and we have to go do it. The INEL must be and has been a pioneer in partnering with industries, academia, federal laboratories, to bridge the gap between basic research and market-driven technology use. INEL's ability to solve critical problems related to the environment, energy production and use, and the U.S. economic competitiveness of national security will go far, and I think will create a very healthy economic climate for our intermountain region.

What I'll leave with you is, it's time to take action. Let's go do it. We have and will have inputs like what we're seeing today. Now is the time to have outputs. And let's start measuring our outputs. And I want to be a part of that process.

Barton Krawetz, Vice President/General Manager, Applied Engineering and Development Laboratory, INEL

Introduction

I want to talk to you about two general things. First, why I think we're here, that is, why the Lockheed team decided to bid on this work and its importance. Second, some specifics about what's happened through the hard work of the men and women of the Idaho National Engineering Laboratory and our customer the Department of Energy—in Washington and in Idaho.

At the outset let me say that I think the reason we are here really has nothing to do with sustainable futures. No one wants the alternative, which is a nonsustainable future. I think we're here today because the country is, in some way, in fibrillation. Those of you with thinning hair, as mine, or graying hair, or both, went to school under a model of the United States' position in the world that had to do with National physical security. We had predictable, dependable enemies on distant shores. These enemies would produce new and effective weapons and ways to grieve the free world on predictable bases. We could go to the Congress, and we could get the funding to build the weapons that would permit us to continue the American way of life. It sent me to school; it sent my kids to school. In some ways, I miss that consistent, dependable enemy—as long as we don't have to wind up fighting them and hurting our people. I think that what's happened in the United States, though, is that the way that we look at ourselves has changed. As the Russian Soviet Union was brought to its knees by the power of the west and the strength of the system under which we live, a vacuum occurred, and that vacuum is now being filled by various attempts to redefine how we ought to interact with the rest of the world. We had a problem with national physical security. The government required weapons and people. We put uniforms on people, and we made them ready, and when the call came we sent them to fight for what we believe in. Today, the fight is for national economic security.

Government's Role

Let me talk about those words. If you don't believe it's national, then there's no reason for the feds to be in it. If you want to leave a lot of the security of the United States in the economic sense to Lockheed, we can choose to do that. I think it would be a mistake. The people need to be represented, and the national establishment is the place to do that. But who are the front line soldiers in the national economic security struggle? They're not people in uniform. They're the people in industry. They're the people who get out there everyday in business suits and working clothes and take on the challenges presented by distributed, uncertain, impossibly occurring set of demands for the competitive forces that have made America great. In a lot of ways, it's organic. You can't point at an enemy in a uniform and say that's the problem. And more than an enemy, it's a challenge. It's an invigorating challenge in national economic security.

The role of government had been to require the physical security stages: build armies and send them away, as I said. And industry was a servant in the national interest of the government. In the new fight, for rational economic severity industry is in the front line, and the role of government (in my mind—this is not representing the DOE and may not even be representing my boss)—the role of government is now to support the front line soldiers, the industrial

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requirements. The ways in which that can be done, first, could be the subject of a set of other conferences, but I think the reason we're here today is because the administration has said that rather than getting ready to beat an enemy on a field of combat, we need to prepare ourselves for an indefinitely long struggle to retain the American way of life in a world of no evils. That means that unlike the physical fight where we bring what we have and use it all up without regard to what the impact might be except to win, in the new struggle it benefits no one to destroy the resources that allows the struggle to go on for there to be winners, and hopefully a large number of winners, as we move together toward a place where prosperity can be assured for the long run.

Now, in the national economic security fight, the strongest foundation, as always, is technology. The real measure of merit is getting to market, not hiding information. In my experience in the defense business, companies would succeed by collecting competitively important data on materials, techniques, and systems and take on contracts and win them and keep that data unavailable to the rest of the population. While we were doing that, we were watching counterpoints to the American interest, like the Japanese, and in some ways the Europeans in the past, taking this data, begging it, borrowing it, buying it, stealing it, and getting a market where the action was. With the new fight, partnership for a sustainable future is about getting things to market faster and better and quicker and cheaper and continuing to do that for the indefinite future. The Japanese have hundred-year plans at which many of us scoff. Big parts of those plans have to do with how to acquire support, maintain, and preserve natural resources. I find them very thoughtful, and I think we're embarking in the same sort of course today and in the future with the sustainable use of natural resources. I want to thank the DOE for having me here today, and I want to assure you that despite the fact that I'm not going to tell you how terrific Lockheed is, it is a great place. I'll dispense with that. I want to join you in this partnership because I think it is very, very fundamental to arraying the country in the new field of honor that we face.

Research and Development

The U.S. Government operates the largest research and development machine in the world, and the Department of Energy manages a key piece: more than 25,000 researchers constituting 65% of the noted scientists and engineers in the United States, \$7 billion in annual R&D expenditures. In my introductory remarks, I said that if you don't believe that this is in the national interest then the feds ought to be out, and I said that I believe the feds ought to be in it. The feds ought to get ready and support industry. That doesn't mean that we're going to take your tax money and out industry the industry, but support industry in ways that it needs to take on the challenges it faces.

The DOE, by the way, in my mind is an interesting place to be, because as we move from national physical security, I think we need to move away from the department of defense and move to a department of economics security. We don't have one of those, but I gauge that the DOE is a major player in that business, as is Congress and certain other places. But the place that business should not be in is the Department of Defense. I think the great challenge is to find a departmental entity that can assist us in these economic pursuits—not take it over and not regulate us to death, not specify us to death, but to represent the interests in the economic fight in the same way that the DOD represented us in the physical fight. I say that the DOE has got a very central role to play in that. The laboratories, of which the INEL is one, and a great one, can

be a source of societal benefit. I say *can* because we'll only be that if you want us to be that. It's up to the politicians and the people what the role the laboratories have. But I can tell you that the laboratories, all of them, are rich, deep, prolific containers of information and know-how for which you pay full measure. I cannot imagine why we would not want to extract all the value to society from that. My perspective, and I think that of Lockheed's, is to extract all of the value we can to improve the quality and content of American life, to convert consumption to investment.

We have technology assistance programs. When we have special facilities that are not fundamentally competitive with industry, we make them available to industry so that they can better understand their processes and techniques and to assist them in international competitiveness. We also do that with state and local governments. In fact, I have a note here that says that for state and local governments we can spend a week of time without cost for assessing solutions or recommendations if they request assistance. For commercial entities, free up to 40 hours. In 1994, the men and women of the INEL provided 21 companies with such assistance. There's more that came, and similarly the CRADAs and the other interaction mechanisms are still available.

The Lockheed Team

I'll talk to you now about the team that your government has picked to represent it and do the strong back work at the INEL. Lockheed, I think, in most people's minds stands for handling large complex problems and for excellence in systems engineering. Problems the nation faces for decades have been entrusted to Lockheed. Lockheed leadership from the chairman on down are attracted by the ability to work on programs of national importance and that's the fundamental reason that we took on this INEL campaign. We feel very fortunate to have won it. We're at the cusp of a new paradigm in which the country will interact. None of us will live long enough, except maybe the younger ones in the crowd, to get a chance to do that again up close and personally.

The Duke Energy and Science and Services company represents some of the best nuclear reactor operators in the world. We were asked by the DOE to make sure that we didn't make a mess of things that were ongoing in the nuclear area at the site. We've done well. There have been no incidents nor will we have any; we can't. Babcock and Wilcox, and now the McDermitt company has a lot of expertise in spent fuel and doing certain kinds of specific manufacturing. That work had formerly been classified. What is going on, in fact, is using depleted uranium for armor on M1 Abrams tanks. The Rust Corporation is well known for its leadership in remediation and environmental restoration. Parsons Company is RCRA, held separate under the requirements of the law to do the RCRA function. CRC, Coleman Research, brings to us lots of expertise in conduct of operations, that is, taking care that the procedures and the techniques are in place to avoid incidents and accidents. Thermo Electron is quite an interesting company about which I'll talk some more later but represents our window into the world of venture capital. It is well known. Maybe Bill Schutte will talk to you about some specifics having to do with the fraction of U.S. jobs created by venture and new startups. It's a large fraction, 65 to 70%.

Specific Commitments

What did we agree to? Mr. Wilcynski gave you a quick rundown on that yesterday, so I'll just take a few minutes. We're going to try and clean up the place nine years earlier than

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required in the 1993 ER baseline. We've signed up to create 1,000 new jobs in the next five years and make investments, in the region, of about \$5.5. Thermo Electron, with venture capital, has set up a revolving credit account of \$10 million. The fact, there's a billion available if there are a billion dollars worth of good ideas. Venture capitalists have a way of finding money if they can be assured of successful investment. So, \$10 million is kind of a perpetual amount in that account to be withdrawn when great ideas come along. On the board of Thermo Electron is a fellow named Peter Crisp. Peter Crisp is the chairman of the Rockefeller family venture capitalists activity. One of the most unique in the country. They invested in a small outfit called Apple when it had five employees; three of them were high school students. Then, in recognition of the need to provide access and opportunity for all of our people, we've committed to sign up to a 180 million dollars a year to small, disadvantaged, and women-owned businesses. But I want to tell you, none of this is going to be a give away. I don't think the Secretary of Energy wants us to start businesses and watch them fail. I think you'll learn in a little while that we have a recipe for finding out how to make businesses succeed.

Upfront Systems Engineering, Systems Thinking

We're learning our way around the site. The Lockheed team is a good team, but it's been in the saddle for only four months. As time goes on, we're going to be more of the muscle of the \$43-billion-a-year team playing in support of the Department of Energy's goal. We've begun partnering with local and regional companies and universities. In fact, we did a spinout of one company during the proposal activity to illustrate our commitment to creating new enterprises. The Department in its Request for Proposal wanted a new approach to things and emphasized extracting latent value from the people's investments, working on commercialization, and increasing the ability of the United States to compete in worldwide markets. We're committed to that. You've heard that I've spent some time at the Skunk Works. Kelly Johnson is Skunk Works, the one that brought us the SR71 and the U2 and, in fact it's not well known, that brought you the C130. Kelly Johnson said that was one of the ugliest airplanes he ever saw, and he never wanted to see the thing built. We built 2,010 of them. He was good. He wasn't perfect. The Skunk Works, though, is unique in that it empowers small teams to get jobs done. We brought it to Idaho and are now installing the concept into how the work will be done at the Idaho National Engineering Laboratory.

Systems engineering and systems thinking: we heard a lot about that yesterday. I was impressed at the frequency the INEL had taken a systems approach to problems. My reflex is, if you give me a problem, I'm going to ask engineering to determine what we'll get. What is it going to be? About this big and that high, and it's going plug it in here. I have to resist that. In a company like Lockheed where we take on large problems, the answers are not going to be obvious. The systems engineers are the most precious of the entities in the corporation. In fact, that's the group of people from which program managers are drawn. It's the group of people who look at all the requirements, soft and hard, form a systems engineering management plan, and actually flow the requirements from this fast, this high, this much energy, and whatever the requirement is now, down to the design-two level. They give the electrical engineers the constraints. Design this. Here's your budget dollars, power, weight, and so on. So they're a very, very important entity. We want to do all that upfront and avoid the "oh goshs" when you find out you forgot something.

Some Specific Successes

What have we done? Within 30 days of the time the contract was signed, through the energies of the Department in Idaho, Delores and Ray Barnes, the Secretary of Energy appeared at the Idaho National Engineering Laboratory and, among other things, announced that we had been authorized to promote a technology exploitation kind of program. This ought to be of great interest to this group because it was founded on the premise that often in our hearts we want to do the right thing, if we only knew how. Right. We want to make technologies available. Government, I think, wants to do the right thing, but under the strictures in Washington often you get operating one lever at a time, and you say, surely if I give these people more money, more good things will happen. Surely, if I give them more money quicker, something would happen. Surely, if the programs were more persistent and predictable, better things would happen. It turns out these are multivaried problems and they're complicated to understand. So we proposed and got approved the notion that there ought to be an experimental bubble around the INEL for 5 years, to give us the ability to adjust the knobs on these many problems, to offer a success, or at least well-codified understanding of what it means to be a preferred partner to industry, what it means to transfer technology, to commercialize, to install women and other represented minorities in business. You can view us now as a broad experimental ground for taking on important issues and services for the department in service of the new paradigm.

When you build a new business, it has all the properties of an embryo. It needs special support. The notion that today you are in business, hang that shingle, and you get out there and compete with people who have been in the business for 40 years and expect to win—that seems to us to be a loser. So, we're going to the Secretary to say, look, these embryos need life support. We want to have special dispensation for the period of this experiment to be relieved from the rules of sole source contracting. We would like to be able to specially support these entities. I can't tell you what the number of dollars is, but the period of time we think is between two and four years, time enough that they can be brought to maturity and compete on a relatively equal playing field with people who have been in the business. We hope we'll get that. We'll have well-documented experiments involving that kind of management end. My hope is that with the help of our university consortium, including regional universities, these will be learned but practical experiments. They'll show up in your training magazines, and they'll offer your CEOs and your chiefs of engineering ways to do things more efficiently, effectively, and with higher competitiveness.

Lockheed Environmental Sciences and Technology Company was awarded separately from, and has nothing to do with, the primary competition to win the INEL contract, an important piece of technology in the so-called Pit 9, to clean up. It's a mixed waste activity. We moved a division from Houston to Pocatello, and will create 250 jobs. Rust International is going to build a compost plant. I think Twin Falls is one of the primary areas to locate a plant. Parsons Engineering is putting in a field office and Fluor Daniels will also. We recently licensed a software product called WF GOPHER, which is an internet access tool that promises to bring in decent amounts of royalties. We like that because in our contract we have the good opportunity to share in the benefits of those royalties, as do the people of the United States. Very recently, the INEL was designated the lead laboratory in the complex for mixed waste, and that means, in effect, one of the key program managers is here. It means we're going to do the systems thinking. Not all, but we'll do the systems thinking for how to proceed in mixed waste for the whole complex. We have in place a consortium led by MIT that comprises the MIT set, the regional university set, and the nonregional set to do the research activity and the evaluation of the commercial potential for a number of our technologies. It will install in this region additional

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infrastructure to sustain us as an engine for advanced technology and commercialization for the decades ahead, even after Lockheed's done here. During the proposal effort we created a company called Plasma Quench Technologies. It's going even faster than the venture people thought possible. The company uses plasmas to heat up and oxidize zirconium, cool it quickly, and produce spheres of zirconium that block UV light. They're very uniform and they can be produced more cheaply and more uniformly than by most other processes. They'll be installed in cosmetics to prevent excessive irradiation from the sun. They're about to do very, very well.

Materials Testing Laboratory

What did we do with the lab? Again, this all happened before we showed up. In the lower right hand corner of the desert picture on the screen is a small building with a bunch of hazardous stuff. It was decontaminated and decommissioned, and after the building was dismantled, the ground is pristine, at the lowest limits that we know how to make. It's perfectly useable for a whole bunch of applications. We believe we lead the way in this area. And we're doing it more cost effectively than most other DOE sites. That is validated. And we're going to beat the numbers that INEL has enjoyed in the past. We're successfully managing a 2-billion dollar cleanup program. I can say that over a 160 of 400 waste sites have been closed in three years. Ten of ten Records of Decision, 25 of 25 very enforceable milestones, and more than 183 interim milestones were achieved on or ahead of schedule in three years. We think that the systems engineering approach will be the way to beat the date by nine years. Some of the analysis I've seen suggests that time-honored ways of doing high-level liquid waste cleanup might have been wrong, and we might be able to save a couple of billion dollars by another approach.

Large-Scale Aquifer Pumping and Infiltration Tests

We sit on top of one of the largest fresh water aquifers in the world. You heard yesterday and you read in the papers of the concern of the Snake River Alliance and others about the health of the aquifer. Governor Andrus was concerned. When you mess up that aquifer, the potato business is over. It's a very serious matter. So, what people did here was to design a large-scale infiltration bed. It was a hydrology examination designed to determine the contaminant phase and transport pathways in the aquifer. It's the largest test of its kind, 3,000 gallons per minute over a 7-acre test space, 600 ft across, 4 ft deep, 6 million gallons of water, 67 wells drilled. The idea was to understand the diffusion properties of the water over this precious aquifer. And whereas I don't think that the detailed coefficients and equations can apply to another aquifer, the process for running these tests is now well-understood, and the next one in some other important filtration problem can be done a lot cheaper.

Data Access

Another unifying principle I heard here yesterday was data access. Let me tell you a short story by Arnold Pensey, is a nobel laureate, vice president for research at Bell Labs in Murray Hill, New Jersey. He said in the era between the 60s and the middle 70s our big problem was, could we have enough stuff, computers, food, cars, and so on. That was answered. Between the middle 70s and the 80s, the question was could we have enough quality of stuff. We had cars, but they broke a lot, and we had computers but they didn't work so good. We answered that question, yes; we can have quality. Now, we are asking ourselves, what is the challenge between the middle 80s and the rest of the millennium and beyond. Can anyone guess what that is? The

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answer, according to Pensey, is that the goal for this next period of time is harmony. Well, what's he talking about? Harmony with the environment: no more VCRs flashing twelve o'clock, people able to really link with a multi-dimensional, mind boggling databases. Now, you have to hire special folks to interpret database and then believe what these special folks say. How many of you have struggled sometimes believing what the special folks say. I was back at a university and there was a laboratory there for media. I saw some data banks that were a history of stock prices. But the lab had a virtual reality helmet. The kids were riding along with these helmets on. When they buck a lot, that means something to them. It turns out to be correlated with some behavior of the stock, and when the slopes went that way the lights were red, and so they were able to take complex data basis and connect the people and produce a very harmonious connection. A lot of what we're doing today, and a lot of what's going to happen to sustainable resources, is the harmony with which people can be connected to those problems. I'm not talking about technical people, they're included, but I'm saying that everyone who's got a stake in this thing needs to be able to feel in his or her gut that it's about right and its getting better. That's the way you're going to get support from people. I think engineers and scientists can help produce data understanding and visualization that will help support that.

Our capabilities include the following:

- Systems engineering/analysis
- Applied engineering
- Project management
- Environmental management
- Environmental restoration
- Environmental, safety, and health
- Sensors and systems
- Remote sensing and handling
- Pilot demonstration
- Advanced nuclear technology
- Material processes.

Focus Areas and Projects

Our focus areas will be on energy, mining, forest products, water environment, agriculture, examples of which follow. I'll comment on them in conclusion:

Advanced Fossil Fuels

- Share INEL capabilities—refinery life extension, remote sensing and handling
- Commercialize INEL-developed products/tools

Autonomous Petroleum Tank Inspection Vehicle

- Cooperative effort with industry
- Significant industry cost reduction (\$100M/yr)

Environmentally Friendly Hydropower Turbine

INEL Mining and Minerals

- Desulfurization of coal

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- Bioprocessing of cyanide (test sites in Nevada and Montana)
- Use of organic materials for taking the acid out of acid mine drainage

Forest Products

- Growing conifer embryos—a device for growing plant embryos to maturity
- Forest products offgas bioprocessing
- Ecological risk assessment

Water Resource Management

- Water quantity/condition have a pervasive impact on sustainable development
- Water resource management computer simulation model of the Pacific Northwest
- Interested parties and policy options supported by internationally known experts

Environment

- Biocube—aerobic biofilter developed to process gasoline vapor off-gas streams
- Cryo-cutting tools—high-velocity cryogenic fluid jets that cut or clean surfaces without secondary wastes

Yield Mapping of Potatoes

Agriculture and Food Processing

- Intelligent farms management systems
- Spray nozzle design
- Time release fertilizer
- Sonic sensor system
- Microbiology of sugar plant flume systems
- Rapid agrochemical sensor (secondary ion mass spectrometry)

Trace Surface Analysis by SIMS

When you're in the nuclear business, you do a lot of stuff with sensors and remote handling. It turns out that all of the reactors are not a lot different than old refineries. So, what we learn about the care of old reactors can be applied here to sensors for understanding whether stuff is leaking, whether stuff is aging, whether stuff is available. We're applying those things to everything from exploration to wondering where the Alaskan pipeline might be leaking and be able to read that immediately before the tenth drop hits the ground. We have an inspection vehicle. One of those robots crawls into tanks and takes a look at whether they're corroding and looks at other things. I'm told that there are 10,000 petroleum tanks in the United States, each of which is drained, cleaned, and manually inspected every 10 years. When you put the numbers in, this robot can generate somewhere between 100 million and 400 million bucks a year in the commercial market. We developed it for scooting along inside contaminated tanks. Now it's available for other work.

We've got problems in this region with water. One of the things we're doing is working with industry to understand how to make fish safe from turbulence. Mining materials are a big set of things that we're doing here. We understand how microbes can eat sulfur and remove system cyanide. With J. R. Simplot, we're doing things to control the release of biological phosphate and assisting in the cleanup of tailings from acid plants. Biocubes, in different incarnations, basically

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takes different smelly gases or other products and turns them into water and carbon dioxide. Ecological risk assessment means we've developed monitoring operations management for the Fish and Wildlife Service to help manage their collection and understanding of data. We did a fish kill study in Henry's Lake in response to a large kill last year.

Water keeps showing up. We're trying to build a visualization interactive computer model so people who worry about water can visualize what's going on in fairly sophisticated ways and reveal both to themselves and their constituents what needs to be done in the way of water resource management for that region.

Waste streams are something we don't want a lot of. A stream of a cryogen can be used to cut things. And when the cryogen gets warm it becomes a gas, like nitrogen or CO₂ and doesn't produce a liquid waste stream. That's kind of nifty when you're cutting in foods and metals and anywhere where you're struggling with liquid plus abrasive plus whatever comes out of the kerf of a saw. EM50 did that. We initiated that with some of our R&D lab directors.

We've heard some about intelligent farm management. That's looking at the things from the top down and seeing what makes sense to do. Mapping of potatoes from the cab of a tractor: that is really becoming a very high work-load place. Automated navigation of that tractor and related apparatus will take a load off the operator and will collect a lot of data on the yield as a function of the position of these fields. The global positioning system, and something called a differentiated guess, will allow farmers to measure the position of that tractor down to centimeters and look at the yield for that area of the field and understand where to put the fertilizer and water and such. When you look at the yield of a certain farm with pivots bobbing over large round areas—I guess there were 3 or 4 pivots and 3 or 4 quarter sections—it turned out the region of high yield was a rectangle. It had to do with the way the pivots were putting on the water. So, there's a lot of things to be gained in terms of integrated farming.

The last example is a gizmo that maybe you've talked about. Anyway, what we do is take uranium oxide and bang it into surfaces of nonsoft offending surface contaminants like fertilizer and pesticide and so on and read it in the mass spec and you can tell whether food plant material, paint chips, and so on are contaminated, and do it every efficiently. We've had a big piece in developing that. Finally, honest to gosh, we're redefining the role that resources can play. Lockheed is proud to be a contributing part of it. Thanks very much.

4. Industry and Technical Panelists

This section of the report contains addresses given by the industry and technical panelists. The workshop was designed to focus on six areas related to sustainable use of natural resources: agriculture, water, mining, forestry, energy, and environment. The industry and technical panel consisted of an industry representative and a technical representative for each of the six focus areas. In general, the industry panelist addressed policies and laws that impact the industry's ability to conduct business sustainably, and the technical panelist addressed research and development of technologies that could aid business and industry to conduct their operations sustainably. These addresses helped to frame the immediate context for the focus group meetings that were held later in the workshop. The focus group reports are presented in Section 2.

Agriculture

Gregory Ledbetter, Owner, C Bar M Dairy—Agriculture Industry Panelist

What I want to talk to you about briefly is my vision of sustainable agriculture. Discussions about sustainable agriculture have to take into account two words, economy and ecology. Consider that the root of both of those words comes from the Greek word, *ecos*, meaning house. How do we handle our house? We can't have ecology without economy. When people are hungry and desperate, I don't think they spend a lot of time thinking about the ecology. Without a healthy economy, ecology is forgotten. We need only to look at the former Soviet Union and Eastern Europe and Third World countries to see the ecological problems caused by a poor economy. The goal of sustainable agriculture, as I see it, is to feed the world's population today and in the future, with minimal environmental impact, and to do it at a profit. All activities have some environmental impact. When you got up this morning, how many of you thought about the environmental impact you had when you went into the bathroom. Everything we do has some environmental impact. The trick is to minimize that impact without shutting down industry and all of us.

I'll talk to you a little bit about something I call the killer hamburger syndrome. I'm sure most of you have heard about the bad hamburgers that Jack in the Box sold in the Seattle area within the last two years. Interview people kept saying, "How could this happen? Why hasn't the government done something? We need more regulations." Well, how did this happen? There are four reasons. First, the meat got contaminated. Second, the meat got warm. It wasn't kept refrigerated. Third, it wasn't cooked properly. All of these activities were covered by government regulations.

So how could this happen? Who was at fault? The industry was careless certainly. But I can guarantee that this is not going to happen again, because when all is said and done, the industry is going to pay out millions of dollars in claims on this issue, and that kind of loss is not sustainable. What about regulatory agencies? Certainly they failed. Each of those areas was covered by a regulatory person somewhere who didn't do their job. Unfortunately, there is no cost to the regulatory agencies for poor performance. But I said there were four reasons. The fourth and final reason, the one that I consider to be the most important, is that for the last 10 or 15 years, the public has directed the food safety or regulatory agencies to look for two things: pesticides and drug residues in their food. We have ignored for 10 to 15 years what the scientific community has been telling us, and that is that it's not pesticides, it's not drug residues that are

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going to kill people, it's bacteria. It's gotten so bad that the Center for Disease Control in Georgia has actually quit tracking food-borne diseases. That's a serious problem in my opinion.

More government regulation to solve everything—now there's the hoax of the century. Central control, one-size-fits-all government regulations don't work. Again we have only to look at the example of Eastern Europe and the Soviet Union to see that. But we've become more concerned with the how rather than the results in the various issues that we're dealing with. The Clean Water Act tells me as an animal agriculture person (and I own and operate a dairy) one simple thing: keep the crap out of the creek, to paraphrase it briefly. But that simple regulation has turned into a 19-page document for us here in the State of Idaho telling us in fine detail how to keep the crap out of the creek.

The Natural Resource Conservation Service, formerly the Soil Conservation Service, will come out and help design the facilities for us in the dairies and feedlots on how to keep the crap out of the creek. The problem is that by the time they're done designing the facility, most of us can't afford to build it. We could go out and build a facility that would do just as much good, work just as effectively, for far less than what the NRCS can design. But the EPA wants the facilities designed to NRCS criteria. I think we could all make a case that Mercedes Benz cars are better engineered, but should the government require each and every one of us to drive a Mercedes Benz over a Chevy that will get us there just as safely? Tell me no crap in the creek and I'll do it. I'll figure out how to do it and how to do it economically.

Another hoax that's being perpetrated on us is that big is bad. If we could just return to the days of the family farm, everything would be great. What is the family farm? I have a family farm. My wife and I own and operate a farm. We have to milk a thousand dairy cows. We also have seven other families that we employ that live on our farm. They enjoy the rural life style that would be the envy of anybody sitting in here. But are we considered a family farm? No. We're considered an industrial dairy. I ask you, does the thousand cows on my farm produce any more waste than a thousand cows on twenty 50-cow dairies? In my opinion, larger dairies are actually more environmentally friendly because we have a better economy. With a better economy we have the money to take care of the ecology.

We all know the cattle are destroying the riparian areas in our rangelands, right? Does anyone remember that in the 1960s, the Agriculture Stabilization Conservation Service actually paid range people to cut down all the trees on 50 ft of either side of all stream beds? I know because my family participated in that program in California when I was a kid. Sure we had the water, and with water comes erosion and everything else as you can imagine. It wasn't the best idea that ever came out of a government agency. Yes, we have made mistakes. Yes, we're going to make mistakes. But one thing is for sure, in the American free market system, mistakes cost you money. If you lose money, you're not sustainable.

There is hope. In the Magic Valley we're working towards what I think will be a real model for sustainable agriculture. Farmers down in our area are producing potatoes, sugar beets, corn, and other crops that are processed into food for human consumption. The waste streams from those industries are then fed back to my dairy cattle and to feedlots in the area. Effective in 1993, this amounted to 125,000 tons of potato waste from one plant alone, 74,000 tons of wet beet pulp from the sugar industry, and 50,000 tons of cannery waste from the Green Giant Corn plant. All of this was fed back to animals. The manure and waste from our dairies and feedlots is

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applied back to the ground to produce more crops. Also it eliminated the need for greater and greater inputs from commercial or chemical fertilizers. In the sugar industry alone it would have taken 10,600 tons of coal to dry that 74,000 tons of beet pulp for shipment. Most of what we feed in the animal industry today are waste products from other industries: distillers grains from the alcohol industry; meat and bone meal from the rendering industry; feather meal from the poultry industry; canola meal, soy bean meal, cotton seed meal, all from the vegetable oil industry, and so on.

In our efforts to clean up the middle Snake River, something has become very apparent. As we try to solve these problems, we find obstacles in the way. One of the major problems in the middle Snake area is soil erosion caused by surface irrigation, primarily on the south side, the Twin Falls county area. The solution is simple: put in sprinklers. There's a problem. To put in sprinklers you've got to have power, you've got to have big power. Three-phase power. There's very little three-phase power on the south side of the Snake River. Instead of \$50,000 for a farmer to put in a center pivot, it now costs them 2 to 3 times that much by the time they bring in the three-phase power.

Last spring in our dairy, we entered into an agreement with the Department of Energy, the EPA, and the Idaho Department of Water Resources to do a feasibility study on producing methane gas from dairy waste in Southern Idaho. Our hypothesis was that if this was feasible, it would be great to produce a renewable energy source and we could help minimize the impact of large dairies on the Magic Valley environment. The bottom line is, yes, it is feasible. Technologically, we can do it. We can make it work. But it is not economically feasible, at least not at this time, because of the low power rates that we have in the buy backs with Idaho Power. The economy of this case is going to have to postpone some of our work on ecology.

More and more of today's farmers are professionals. Each of you choose your doctor, your dentist, your lawyer, based on their skill and expertise, just as today's farmer has been chosen for his or her skill or expertise and his ability to produce food to comply with regulations and to do it at a profit. The free market system has chosen those that are still farming today. The question I leave you with for this conference is, will our future policy and hope be based on sound science? As a scientist I certainly hope so. Or will we be saddled with a hoax for the future based on public hysteria and hype. Will we continue to fall victims of the killer hamburger syndrome?

Paul Reep, Manager, Agriculture & Food Products Program, Lockheed Idaho Technologies Company (LITCO/INEL)—Agriculture Technical Panelist

What I'd like to do is to not hit absolutely every technology we're involved with in at the Idaho National Engineering Laboratory, nor the technologies that are available at the other national labs, but rather to highlight some of the areas that are appropriate for this conference. We are working in the agriculture technology arena, everywhere from the on-farm situation to food processing and consumption. It is important that Dr. Ledbetter's point about the food safety issues not be understated. I'd just like to add that food safety problems kill thousands of Americans annually, and at a cost to this nation of about 8 billion dollars in lost productivity and hospital costs. So we're not out of the woods on this food safety thing at all.

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Basically, our agriculture technology programs at INEL focus on the energy issues, the environmental issues, and the economic issues. Technologies that don't wash and don't pay the bills on the farm are things that we just don't pursue.

We focus on three areas in our agriculture endeavors. One is resource use efficiency; that's basically how we keep the resources such as chemicals, water, soil, and other media on the farm and keep them out of the streams. I'll go into some detail about some prescription farming activities that we have ongoing. Another area is bioprocessing and new uses, and I'll touch upon that very briefly when I close.

The Department of Energy system is replete with technologies that were born from many of our previous mission areas. Farmers on the production side are dealing with enemies, just as we had to deal with enemies during our defense program days. These new enemies involve plant stress, plant diseases, and pest infestations. In terms of mechanics, some of the technologies that are needed to thwart these enemies are very similar.

It is appropriate that DOE be involved in efforts to gather information about what the issues are and what the dominant factors are that are driving sustainable agriculture on a farm. Remote sensing, high speed data communications, sensors that do both yield mapping and also water quality measurements are very important. Information management systems is an area that agriculture seems to be very deficient in right now. DOE laboratories can offer a lot in this regard. Systems integration is another area. Agriculture is full of a number of very small businesses that are only concerned about their particular element, and the integration technology is really going to pull these different small businesses together to expand those industries. Guidance systems and some of the more familiar technologies like global positioning systems and geographical information systems are used and are needed.

This [referring to a slide being projected on a screen] is one of our alpha sites up in northern Idaho. We have potatoes up in this area, and over here is canola. This area down here has been experiencing some high runoff. This next slide is a yield map. The yield map provides information about how many potatoes or much canola you're going to take off the land; it also provides information on the well-being of the plants as it relates to the soil conditions. You can also see this area where the runoff was very high; this area is a very low production zone. So what we see on the yield map is a direct correlation to what's going on in the soil. For a long time the agriculture production community was very interested in uniform application of chemicals and water. That interest is changing. Now we are looking for ways to vary the amount of fertilizer and water applied to different parts of a field, depending on slope, soil type, soil conditions, and other factors.

This change represents a marked departure from current irrigation techniques. There are about a 100,000 center pivot irrigation systems out in the fields of the United States now. Right now, water output is controlled by the speed of the center pivot. If you look at what's going in terms of soil type, topography, etc., there is a lot of variability. So what we need is control of individual nozzles along the boom so that we can vary the rate of the application. This is the kind of technology that will keep those products on the farm and out of the rivers.

Because this is a conference on sustainable partnerships, I want to emphasize that the prescription farming activities that we are involved with at the INEL and other national

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laboratories involve tremendous amounts of resources and collaboration between industry, academia, and other partners. The most difficult part of bringing technology out in the open is developing the infrastructure and the working relationships with partners so that everybody understands what their roles and responsibilities are, and so that everybody knows what they need to bring to the table.

Another area that we're working in is new uses, efficiency, and value-added processes from waste products on the farm. For example, we're working on utilization of straw products that are considered now as a waste product. In some cases and in some counties, straw is burned in the field, and it has become quite an environmental issue. Also, it's habitat loss for some birds. We're looking right now at the possibility of blending straw products with wood products. This will make use of the waste by-products and at the same time stimulate an existing industry and create a brand new industry. The design of the processing plants is such that many plants would be located around the region; this would benefit local rural economies.

This is a sample of some of the work that we're doing. It is certainly not all-inclusive, but it gives you an idea of our investments in the resources efficiency area.

Water

Joan Cloonan, J. R. Simplot Company—Water Industry Panelist

I want to talk about both water supply and water quality as they relate to industry. Speaking of water supply, we look at issues such as conservation and availability. On the water quality side, we look at performance standards, economical treatments, and reasonable regulation, that is, are we going to be told what to do, or can we just have a goal and go for it.

I want to talk about what I know about, which is potato processing at J.R. Simplot Company. (Everybody in Idaho knows we make french fries along with a lot of other things, including fertilizers.) Potato processing involves intensive water use, both to grow the potatoes and to process them. The best potatoes are grown on irrigated ground. Here in Idaho and in eastern Oregon and eastern Washington, almost all potatoes are grown on irrigated ground. For a long time potato farmers in North Dakota depended upon God and the rain for their water. Today, though, most of the farmers in North Dakota are growing potatoes on irrigated ground. For farmers who irrigate, water supply is critical.

Potato processing takes huge amounts of water. One of the challenges the industry faces is figuring out how to use less. The industry is working together with government and universities on that issue. We probably use up to 1 gal of water per pound of potatoes we process. That means that a typical potato processing plant uses one to three million gallons of water per day. We use it to wash the potatoes, move them, cut them, and partially cook them. After we have used it, we have to do something with it.

So water supply is a serious issue. For example, one of our plants is located in a critical ground water area. That's forcing us to do something about conserving water in the plant. How do we do it? We don't want to mine the ground water and deplete the supply. Maybe we are in the low point of a drought cycle, and the ground water supply will recover on its own. How do

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we know whether we are in fact depleting the ground water supply? How do we resolve the issue in a location where the ground water is being tapped by many users?

There are competing uses of water. There are agricultural uses and industrial uses, and there is the competing use of electrical power production. Aesthetics. Wildlife, the salmon, for example. I listened to several speakers at a conference about a week ago on the salmon recovery plans. We have a lot of questions. What are the goals? How do we know when we've been successful? How will industry and agriculture be affected? How are economics being taken into consideration? If we neglect the economics, we can't do the environmental part. We can't reach our goals. We can't do the job.

Water quality is the other issue. Once we use it, we need to treat it. In the potato processing industry we try to use everything. Potato wastes are fed to cattle, for example. Potato processors pride themselves on using every bit of the potato. The peel goes to feed, or the peel can be used in making ethanol, and the waste from the ethanol goes to feed. The starch is recovered from the water that's used in cutting the potatoes. All the little bits and pieces that might have been thrown away years ago are now going into hash browns and other types of potato products. We keep looking at ways to do better.

We are trying new conservation measures. To what extent can we use less water? Sometimes we run up against obstacles involving sanitation and food safety. When we recycle water, we run the risk of building up bacteria in the recycled water. Then food safety, not water conservation, becomes the important issue.

When we treat waste water, what standards do we treat it to? Do we need to meet a certain level of lack of contamination in the river or lake. How do we do it? What's the best way? Why do we do it?

A good example is the nutrient management plan for the middle Snake River area. In this instance, a number of interested parties are working together to solve a problem. We found that the potato processing industry, perhaps the aquaculture industry, and other industries were discharging a pollutant, phosphorus, into the water. In all the years that we've been there (and our potato processing plant has been there thirty or forty years), no one had given any thought to this problem. We found that this pollutant was causing a serious problem in the middle Snake area around Twin Falls. The nutrient buildup from phosphorus was too much. The problem demands more treatment, better removal of phosphorus. How do we do that? What are the options? What are the technical solutions? One thing that our industry is doing is to work together with the University of Idaho, on a bench scale at this point in time, with methods for phosphorus removal. We have a goal, a certain percentage of phosphorus removal. It is a short-term goal. There will be longer term goals, but for now we have a goal that we can measure, and we can try various methods to remove that phosphorus.

How else do we use waste water? We can apply it to the land, using it in farming (for irrigation and fertilizer). How do we do this in an environmentally sound way? You see, this use, too, can have an effect on other water sources such as ground water. Is it a legitimate use of ground water allow a slight increase of contaminants such as salts and total dissolved solids to wash from the soil into the ground water? Is that sustainable? We have a lot of questions that we need to work together to answer. How we can we use less water in the process? How can we

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better use water in the process? What's the best use for the waste water from the process? How much can we reuse waste water? Whether it's wastewater from a potato processing plant or a municipal treatment plant, what's the best use of the wastewater? What are we going to do with it? What level of treatment?

In the past, when Jack Simplot built one of his potato processing plants, nearby water was a number one consideration. He would get up and publicly say, "When I build, hell, I build by the river so I can dump all the waste in the river. It's good for the fish." On another occasion, he spoke on the same agenda as Governor Andrus, and they had a bit of interchange. He looked at Governor Andrus and said, "Well, you told me I had to clean it up, and like I told you, I'll do it as long as all my competitors have to do it, too." That was in a day when it didn't seem to make as much difference to put waste in the rivers, maybe because there weren't that many plants back then. We know better now, and we don't do it any more.

We need to conserve the resources, sustain them so that they will be there for our continuing operations. Today when we consider building a new plant, we look at the water resources that are available for our farmers so that we have some sense that they will have a sustained supply of water to supply us with the raw material, the raw product, and some sense that we, for our processing, will have sustained supply of water. It's a significant change from the way things use to be.

I look to a coordination of efforts to reduce waste loading and to reduce water use. Information exchanges may be possible, perhaps through government agencies, perhaps through some other means. Frankly, I'm a little leery of government agencies. The idea is to find a way to exchange information that will help all of us in our plants in conserving water and improving wastewater treatment, but without jeopardizing competitive information. We don't want to bring our competitors into our plants. Nor do we want to see regulatory agencies telling us what to do. We want goals, and we want help in getting that information together. We want to have a balance of interests: environmental, economic, quality of life, aesthetics, and don't forget, sound science.

Roy Mink, Director, University of Idaho Water Resources Research Institute— Water Technical Panelist

I want to re-emphasize the definition for sustainable development, that being, "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." We need to look at the future; we need to get a vision here with respect to resources. This approach is very applicable to water. We want to maintain the viability of the natural resources and ecosystems over time, but also, and I emphasize this, continue to maintain the economic growth and human living standards.

Water is fast becoming a major critical resource. We've got rapidly growing populations and we've got a shrinking supply of clean water. We can't make any new water, so we have to watch out for the existing water. If we take all the water that we have on the earth and kind of pile it upon the United States, all the water total would fit approximately 90 miles deep. Quite an extensive amount. But if we just look at the fresh water we have available for industry, processing, drinking water, etc., we shrink that to a depth of about 15 ft. Of the earth's water,

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2.5% is our fresh water supply. Of that 2.5%, a little less than 69% is locked up and unavailable, in the form of glaciers, ice, polar caps, etc. We can't use that. 30% is ground water; we can use that, but right now we're just skimming the very top. In many places, ground water resources are extremely deep and extremely expensive to get to, and in some cases they don't meet quality standards because of dissolved minerals that occur naturally in the water. Less than 1% (0.9%) is tied up in soil waters, swamps, permafrost, various other sources that are not really useable. Usable surface water, what we have left to work with in terms of our rivers, our lakes, and our streams, represents 0.3% of the earth's total water. So we've got quite a finite amount if you look at it globally.

The earth's population is increasing. In 1955, there were 2.8 billion people. In 1990, there were approximately 5.3 billion. The forecast for 2025 is between 7.9 and 9.1 billion people. We're doubling the population about every 35 years, which is not very long when you consider even our development in the western states. World population and water use are increasing at about the same rate. The increase has been most significant since 1940. Keep in mind that the upper limit of our available fresh water supply is somewhere around 9,000 to 14,000 cubic kilometers. We can't make any new water in this process. Unless something happens to slow or stop the increase in the use of our fresh water supply, we will eventually reach that upper limit.

We've got major world issues relating to water. The Middle East, Africa, China, India, Mexico, have all got major critical water issues facing them in the future. For example, in basins of the Ganges River, there are conflicts between India and Pakistan over water. Upstream users want to use the water in their own country and not allow it to go downstream across the border. The Danube River with respect to Czechoslovakia and Hungary. The Mekong River with respect to Thailand and VietNam. In the Nile basin, nine countries are competing for water in that one river system. Everybody upstream wants to hold the water for themselves and not allow it to go down; if they do allow it to go down, it'll go down in a form that's not useable. It's been said by several researchers that the next major war in the Middle East may be over water instead of oil.

The Colorado River basin covers seven states. This area, very much like the Middle East, is in an arid environment, so water is quite precious. There have been conflicts between the upper basin states and the lower basin states. These conflicts have been occurring ever since the first project was put in to tap Colorado River water. There is also an international problem there with Mexico. Mexico is displeased because the quality of the Colorado River water that enters Mexico is so poor that they can't use it.

There are also some major issues in the Colorado River Basin with respect to water rights: what type of development to allow, and who should be allowed to develop it. Who has the rights, who can use it? A lot of time, the upper basin states have to let the water run past their prime farming lands and their prime industrial areas; they can't touch it, because the lower basin states have the rights. We have to address these issues.

Here in the Columbia Basin, we're into a major conflict because of extensive hydropower and irrigation development. This development had a very good reason, and it provides us with a strong economic base. Now we are faced with a critical issue, the salmon issue. Like the Colorado Basin, we have the upper basin pitted against the lower basin, with Idaho against the lower basin states. Consider also that the major Columbia comes down out of Canada. This puts us in an international situation, with respect to water allocations between Canada and the U.S.

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The Snake River Plain is the watering hole of Idaho. This is essentially where our water comes from, both surface water and ground water. The upper Snake has been developed extensively with development projects. There are several major and minor reservoirs in the system that provide for power, irrigation, and flood control. Many of the dams were constructed back in the 30s, 40s and 50s. The water is used mostly for agriculture and also for industry. This water is the base for our economy here.

We have a major aquifer, in fact one of the largest and most prolific aquifers in the United States, right here in Idaho. With respect to surface water and ground water, we can't look at these systems separately any more as a surface water management and ground water management. In the case of the Snake River, they are very much interrelated. The natural recharge of the Snake River aquifer is from the springs, rivers, and tributaries winding across the Snake River Plain. The major natural discharge is at Thousand Springs in the Snake River canyon near Hagerman, downstream from Twin Falls.

Diversion of Snake River water for irrigation began in the 1880's and was well underway by the early 1900s. Pumping from the Snake River Aquifer for irrigation began in the 1950s, but major development didn't occur until after 1970. The flow from the aquifer at Thousand Springs increased dramatically between 1910 and 1950, in response to the irrigation in the upper basin, which served to add significantly to the recharge of the aquifer. Flows from springs near American Falls and Aberdeen also increased. The flow at Thousand Springs has decreased since then, mostly in response to pumping for irrigation, and possibly also the drought conditions the basin has experienced during the last decade.

However, we can't blame the entire decline on the groundwater development from wells. As we push agriculture and industry to be more conservative, to use less water, to be more efficient, they divert less in the upper basin, and less ends up recharging the aquifer. We are seeing it have a major impact on the groundwater resource that serves as the drinking water supply and the supply for agriculture, aquaculture, and industry at the lower end of the aquifer.

To sum up what I have said here, we need to start working together. It doesn't matter whether it's the salmon issue, or a conjunctive use issue, or a water rejudication process. We are facing possible conflicts, both domestic and international in scope, that have the potential to jeopardize our sustainable future. We need to work together to resolve those conflicts peacefully. We need to look into the distant future and understand how we can better manage our resources so that we can keep a stable, very effective economy and at the same time maintain those resources for future generations.

Mining

Jack Lyman, Executive Director, Idaho Mining Association—Mining Industry Panelist

President Clinton's executive order that established the President's Council on Sustainable Development defines sustainable development as the economic growth that will benefit present and future generations without detrimentally affecting the resources or biological systems of the planet. As you've heard from some of the other speakers, that kind of definition of sustainable development has two important components, the environmental protection component and the

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economic development component. It's important to not lose sight of those dual features of the concept of sustainable development, because an outstanding environmental performance and protection won't give any value to our country or to the world if we fail to provide the raw materials, the finished goods, the necessities that our quality of life requires. On the other hand, economic development which devastates the environment is just as unacceptable because of the significant harm it causes us today as well as the tremendous burden it will place on future generations. America's mining industry is committed to promoting sound environmental policies and practices to insure the safe production, use, recycling, and disposal of minerals.

There can be no doubt that modern mining is a far cry from the mining of a hundred years ago or even 30 years ago. Today we are proud of the commitment we've made to environmental performance. At the same time, history has shown that mining can be a powerful catalyst in national and local economies while providing the materials and products for global growth and development and raising the standard of living and quality of life of people around the world.

Our trade association recently sponsored a poster contest among elementary school students. The contest required that students depict activities or things in their lives that wouldn't be possible without mining. Many of those responses were quite insightful. I love to work with 3rd, 4th, and 5th graders on issues like this. Many of the students recognized the importance of mining to transportation. A Boise student drew an airplane. A student from Firth drew a car. One American Falls 4th grader drew a bicycle, and another a train. Other students realized books, basketballs, and kitty litter wouldn't be possible without mining. Many students saw the importance of mining to computers and televisions and telephones and VCRs and other high tech devices that we all now seem to take for granted. Several students focused on the importance of mining to medicine, dentistry, and maintaining healthy lives. My favorites were the two students who realized that pencils wouldn't be possible without mining, and one recognized that traffic lights wouldn't be possible. As adults we often make life a lot more difficult and complex than we need to. It's always good to look for simple truths like these students did. The simple truth is that we could not enjoy the quality of life, the standard of living that we have achieved in this country today, without mining and the raw materials that it provides. Put it another way, sustainable development wouldn't be possible without mining.

One of the tasks that we were asked to cover in some of our remarks this morning was to make some recommendations, and I would like to recommend that the President's Council recognize this essential role that mining must play in achieving sustainable development. We can't lose sight of the fact that people around the world who aspire to our standard of living will also require the development of raw materials as we have. Those people have as much right to seek the fruits of modern society as we have to continuing enjoying them. Those who would deny those people that right in the name of environmental purity are elitists and shouldn't be allowed to take this country's environmental agenda.

What can our government do to encourage environmentally responsible development of raw materials like minerals? The appropriate role of government, both state and federal, is to establish clear environmental objectives, to set standards, to provide information, to monitor performance for compliance with those regulations, and to develop partnerships with industry to accomplish those joint goals. Government should avoid centralized decision making, heavy-handed regulation, detailed prescriptive regulations, punitive tax policies, and a command-control attitude. I found it interesting in the video that a lot of those, a lot of that record was included,

but I have yet to see some of that implemented on the ground, particularly among federal agencies.

We've been visited by Idaho Governor Phil Batt already this morning. There's been a change of State administration and a new day in Idaho with that change. Already, in only one month, we have seen a marked change in attitudes among state agencies, particularly the Division of Environmental Quality. None of those changes will damage or threaten Idaho's environment in any way, but the relationship has already been improved between the regulated community and the regulators.

Mineral development needs to be allowed to take place in an environmentally responsible manner based on a stable government policies. Permits should be issued in a timely fashion, and those permits should really mean what they say. You remember what Governor Batt had to say this morning about the federal judge. That judge issued an order two weeks ago to halt all mining, logging, grazing, and road building in six national forests. His order was requested by environmental groups who had sued the forest service over its lack of consultation on habitat for salmon. Three major mines, members of our association, were immediately threatened by that judge's order. Closure of those mines would have resulted in the layoff of 800 people, would have ripped 28 million dollars of payroll from those local communities, would have jeopardized 200 million dollars in annual mineral production, and would have idled half a billion dollars of invested capital. That result would have been a direct conflict with the President's concept of sustainable development. It's important to realize that each of those mines has been fully permitted by the State of Idaho and by the federal government. Each of those mines has received rulings that their activities were not likely to adversely affect the salmon habitat. Yet those permits and approvals seem to mean little to the judge's ruling. Fortunately the judge has stayed his order, and we're now hopeful that the mines will continue to operate. We're confident that we will be able to meet any new requirements that may result from a lawsuit.

While we appear to have dodged a bullet in that episode, the larger message is indeed troubling when we think of the concept of sustainable development. How anxious do you suppose other mining companies are to invest in America to provide the minerals that each of us demands? How comfortable can the stockholders, managers, and employees of mining companies be when they're told that their projects have been fully permitted and approved, yet they remain vulnerable to this type of environmental harassment? The mining industry wants and needs consistency and predictability in government policies and regulations. The government should tell us what it expects, and it shouldn't change those rules and expectations once we've relied on them to make major investments.

Vice President Gore has emphasized that industrial processes must become efficient by using less energy and producing less waste. Mining's a tough business, and the successful mining companies of today are already implementing the Vice President's advice. They're investing the time, the money, and the sweat to be as efficient as possible, to reduce waste as much as possible, and to find ways to economize on their energy consumption. All of those actions reduce our costs and increase our profits when there is profit to be made, and they help us to reduce our losses when we have to operate at a loss, a condition that occurs more often than we would like. The government's role in those areas—energy, consumption, waste minimization, efficiency—should be to provide information, to sponsor or encourage demonstration projects, and to craft appropriate incentives to encourage the adoption of promising technology. We don't need

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government to spell out in detail the how, when, and at what cost we are to do our business. The concept of sustainable development is completely consistent with today's mining industry. We can provide the minerals which will be needed to maintain and improve our quality of life and the quality of life of others around the world, and we'll do that in a way that protects our environment for future generations.

Mel Shupe, Manager, Western Environmental Technology Office, DOE—Mining Technical Panelist

I'm going to present a case study for resource recovery, and I'm going to preface that with a brief discussion of what our office is. Western Environmental Technology Office is a new office in Butte, Montana. We're a two-person Department of Energy office, sponsored by the Office of Technology Development at DOE Headquarters. We've been operating now since October. Our facility is located on a 53-acre site. Our mission is to foster environmental technology development, technology transfer, and commercialization. We emphasize technologies related to waste treatment, waste minimization, resource recovery, and water resources. We hope to provide a test bed for innovative environmental technologies, and to provide opportunities for the private sector to participate.

We are involved in programs investigating thermal treatment, spray casting, biomass remediation, removal of heavy metals from soil and water, and others. For example, we have a waste stream remediation project at an operating industrial facility in West Virginia, to remove the chromium from the waste stream at an arsenal. We have a project based at the University of Nevada that investigated ways of cleaning up soil contaminated with heavy metals. We tested seven different soil cleaning technologies there successfully. We have several other biomass remediation projects that address very diffuse concentrations of heavy metals in ground water or the soil. The idea is to have plants that process large volumes of water or soil and separate the heavy metals from the biomass. Obviously we are looking for technologies that would be applicable where more intensive technologies would not be cost effective.

We have a pilot program investigating technologies for processing mine wastes, mainly water contaminated with heavy metals. The goal is to demonstrate innovative technologies for remote mining situations. This is the case study I want to talk about today. In western Montana there is an abandoned open pit called the Berkeley pit. This pit represents an opportunity for resource recovery and environmental remediation. The pit contains approximately 20 to 25 billion gallons of acidic water laden with heavy metals. A record of decision was recently issued that says that cleanup would be deferred until innovative technologies are available, and a timeframe was set based upon the inflow of water, which is approximately 5 million gallons per day. At some point in the future the pit will run over and feed into the headwaters of the Columbia River Basin, so obviously action will have to be taken before that happens.

We are using the Berkeley pit as a test bed for investigating innovative technologies for recovering water and mineral resources from acidic groundwater and surface water containing dissolved heavy metals. In addition to the water, the resources available here include sulfate, iron, zinc, magnesium, and copper. By processing a large volume of water, projected at 7.2 million gallons of water per day, we can produce large amounts of usable resources that have value; for example, 300 tons of gypsum per day with a value of about \$20 per ton, 150 tons of ferrite per

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day at a value of about \$1,600 per ton, and 7 tons of cement copper per day at a value of about \$1,200 per ton. Even though the concentration of copper in the pit water is low, the large volume of water being processed and the value of the recovered copper make it significant. Hopefully the processed water will have value, too.

These are all projections. We are working on the markets for these recovered resources. We want to demonstrate technologies that not only clean the pit water, but also produce products that are usable or marketable to some end user. The form of the recovered product makes a lot of difference in their marketability. Each technology produces a form of heavy metal concentrates and usually suite of heavy metal concentrates, so we have to try to match that product to some particular use. For instance, if the product goes to smelters, we have to look at the different smelter operations to see that we have a product that can fit their operation. That would increase the product's value.

This pilot project is funded mostly by DOE/OTD but also by EPA and by contributions from private industry. We also have a support group that includes state agencies (Montana Department of Health, Montana Bureau of Mines, Montana College of Mineral Science and Technology), public interest groups (Clark Fork—Pend Orielle Coalition, Citizen's Technical Environmental Committee, New Butte Mining Company), and private sector participants (ARCO, Montana Resources and ASARCO, Mountain Con Mining Company).

No single technology will clean the pit water and recover the minerals. We are looking for an integrated set of technologies. The following is a list of approved technologies that we are in the process of testing for the pilot project. These technologies were competitively selected in response to a Request for Proposal. Each of these companies has a particular specific technology that they are bringing:

- Vail Research and Technology. Metal precipitation through the application of pulsed electrical discharges.
- Electrochemical Design Associates. Rotating cylinder electrode cells coupled with electrochemical ion exchange units.
- IBC Advanced Technologies, Inc. Selective metal ion removal with proprietary ligand technology.
- E-Rem, Inc. Metals concentration accomplished by formation of clathrate compounds followed by metals extraction using electrocoagulation and acid/ammonia neutralization.
- International Technology Corporation/Chromatochem, Inc. Selective solid phase extraction of metals with a chelating agent attached to a solid substrate.

We are not focusing on basic research or bench scale demonstrations. We will be demonstrating technologies that are fairly mature, on a pilot project scale, technologies that are very close to engineering development, in forms that are useable to the customers. We will look at the costs of the pilot project, and we will project those costs to full scale. We will identify the costs of processing and transporting the recovered products. We will also look at the potential

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for revenues; we will identify markets for the recovered products, and we will identify the products' value.

We expect that the technologies that are developed and demonstrated by this project will find customers not only in the federal system, such as the Department of Energy, but also private industry. There might also be an international market for such technologies.

There are a few barriers to full implementation of these kinds of technologies. Resolving intellectual property rights for public/private technology partnerships is a major barrier. Cost is another barrier, and there are others. However, we are optimistic that we can overcome these obstacles.

Forestry

Donald Smith, Vice-President, Timberland Resources, Boise Cascade Corporation—Forestry Industry Panelist

Part of my job is finding the sites that Boise Cascade needs to run all of its operations 10 to 20 years from now. We have to decide what we need today, but the question is, where will it come from 10 to 20 years from now. That's a question that has become a lot more difficult to answer. I've been in this job seven years now; when I took it I didn't know it was going to be anywhere near this hard.

Boise Cascade is in three general businesses. First we are a distributor of office products, the largest distributor in the United States. Second, we are a distributor of building products—plywood, lumber, and engineered lumber. The third business is paper. We make coated paper and uncoated free sheets, the stuff that runs through your copiers and through your computer printers. That's the primary product that we make at Boise Cascade in our pulp and paper business. So we appreciate all the paper you use.

There are two drivers that create demand for our products. One is population growth, and the other is the affluence of that population. As population and affluence increase, the demand for our products increases.

Our strategies to grow are driven by two fundamentals. One of them is that you either grow or die. In this business you've really got to be fast to stay alive right now. The second one is that our customers expect it. The reason they expect it is because they continue to see an increase in demand for those products, both here in the U.S. and abroad. People are using more paper, more cellulose products, and more office products, all across the United States and all across the world. When we have a meeting with our customers, they ask us how we are going to provide the extra supply that they are going to need 10 years from now.

Let me give you an idea of the size of that demand. One and a half billion cords of wood are used per year for forest products and for fuel wood. The two activities together create that consumption. Fifty-four percent of that 1.5 billion cords is fuel wood; most forest trees are harvested for fuel rather than for forest products. That's because most of the places in the world, where they have less developed economies, still have to rely on wood for energy just to stay warm and cook. In the world, 690 million cords of forest products are used for building products and paper. In the United States we use 255 million cords of forest products.

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Let me explain to you about cords so that you can really understand the size of what I'm talking about. An 18-wheeler completely loaded with wood, whether it's chips or pulp wood, has about 10 cords on it. It takes about 2-1/3 18-wheelers per second to supply the U.S. with its forest products. It takes about 13 of those trucks to meet the world's needs every second. To get across this room at that rate they'd have to be going 500 miles per hour, so they'd probably break a law somewhere in the process. A lot of wood fiber is used in the world, and again, most of it is used for fuel.

As countries move forward they transfer that use from fuel to forest products, paper, and building products. You can really see that happening in a country like a China, and as they start to emerge as a more progressive consuming society, they quickly begin using more paper. It doesn't take more than a tiny increase before that turns into a huge amount of demand. Yet they have a very, very primitive pulp paper industry. So the question is, how will they meet those needs? You see the same scenario in other countries as they start to emerge.

The point is, world-wide consumption of forest products, paper, lumber, and plywood is not going down. We expect an increase, and every analyst that really looks at this continues to predict that it will increase. In the United States the projection is more complex, but our consumption still continues to grow at the rate of about 1% per year. That's equal to what we call two world-class paper mills, each using about a million cords a year. This means that each year we have to build or provide the equivalent building of two brand new paper mills in the United States, where it's probably impossible to get a paper mill permit any more. We have tried; other people have tried. It is unlikely that anybody will ever get a permit here, so the supply has to come from offshore to meet that demand.

We talk about sustainable development at this workshop, but for our industry the discussion is rather ironic. During the past 20 years there has probably not been a paper mill built that didn't have extensive research done by the company that was building it, to determine whether or not they had the resources and the timber to run that paper mill. Today a paper mill costs about a billion dollars to build, three billion for a really big one. Nowadays you are betting your company when you build a new mill. The last paper mill that Boise Cascade built was in International Falls. It cost about 470 million dollars. It took three years to construct, and it took two years before that just to get the permits. While we had it under construction, we had to renegotiate nearly every one of the permits before we could ever run the mill. That kind of experience continues to force us to ask the question, "How will we provide the forest products we need to meet the customers' needs?" My boss sent me to this workshop to share some of our experiences with you. Under the present circumstances, we have to look all around the world for places where we can do business to meet our customers' needs.

We have decision criteria that we go through to decide where we can do business, and I'll share some of those with you. First, return on capital investment. We try to invest in places where there is some assurance that there will be some return on capital investment, ours and other people's. If we think we can get our money back and we can meet the customers' needs, then there's a chance to make a profit. If there's no way we know we're going to get our money back, then that's not a place where we want to make an investment. The places we look for are those that have a democracy and private ownership of lands. I can show you a number of countries around the world where they don't have those qualities, where they're not practicing sustainable management. Probably the easiest I can point to is Russia. Other places are China

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and Venezuela. In these and other similar places, their governments' forest management plans are a lot harder on their forest resources than what private enterprise or private ownership will lead you to do.

The second criterion is regulatory objectivity. We look at places where we can work with the government. The best examples that I can give you are Sweden and Finland, where their governments have a national policy to develop their forest products industry. That's part of their national strategy; they don't regard the forest products industry as an industry to be eliminated. Japan has the same kind of strategy with most of their industries. The contrast with the United States is dramatic. Here we spend a major amount of our time in court with the Department of the Interior, the U.S. Fish and Wildlife Service, the Environmental Protection Agency, and other government agencies that resist our efforts to do business.

Third, we look for long-term stability in the economy. That's a big challenge for smaller countries.

Fourth, we look for a responsive legal system. One where, if you go to court, you get an answer back within 6 months or a year, not one that takes 20 years to go through the system to get a response.

Fifth, we look for a level international playing field. We look for places where there are no protective tariffs either way, either for our industry or against our industry. We prefer to have a free enterprise opportunity.

Sixth, we look for aggressive research to provide process and utilization technology. We used to have that kind of research in the United States. We still have it to some degree. We look for that in other places, and it's one of the hardest things to find in other countries.

What are the basics and the research that will help our industry? And where can we look for that? Some areas where we can use some help are paper, engineered wood, biotechnology, and other. I can't talk about all of them now, but I want to focus on four specific areas that would help the industry: genetic engineering, data from remote sensing (satellite photos, etc.), life-cycle analysis, and returning to science instead of political pressuring as the basis for making decisions.

There is some urgency on genetic engineering. Other countries have scientists who are busy working on how they can use genetic engineering to improve the plants that they have in their countries. Typically, these scientists were trained in the United States. Here in the United States, it takes an incredible amount of time and effort to get genetic engineering technology to a commercial level; this is true of the tomato, for example. We need a better way to use genetic engineering with the trees that we raise here. Otherwise, we will be working at a real disadvantage against countries that have the climate and soil to grow trees like we never dreamed of here in the United States. The best places we have to grow trees in the United States are probably in the Southeast on private lands or on the West Coast, or the Northwest on federal lands and some private land. Some places in South America can do twice as well without trying. With a little bit of technology, they can do eight times better. We are in a race to try to keep up with these folks.

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The second example of an area where we can use some help is data from remote sensing. Our military and Central Intelligence Agency have satellite data that are ten times better than any of the commercially available data that we have to work with now, for either here in the United States or other parts of the world. The information is there. We've already paid for it. We need to figure out how to get that data processed and available for the industry to use. This kind of information would help us do business and improve the fate of ecosystems by helping us monitor their health and their sustainability. It is frustrating to know that the data have already been collected, and we just can't get to it.

The third area is life cycle analysis. We know how life cycle analysis can be done. It's been tried several times. Each time it's been cut out of the political agendas. We need to get on with that part of it and get that information into the system. I think there are very great lessons to be learned in that process.

The last area in the list is science and politics. In the forestry sector, we have become so involved so intensely in the courts and in the political arena that some of the scientists have been contaminated. It is very difficult now for us to go into the court system or the political and have confidence in the scientists. That's an unfortunate by-product of politicizing science. Somehow we've got to get back to where we're really dealing with the science. We need the facts. Everybody needs the facts.

Improvements in these four areas would help us as an industry faster than probably anything else.

William Apel, Principal Scientist, LITCO/INEL—Forestry Technical Panelist

We are working on several projects at the Idaho National Engineering Laboratory that relate directly to the forest products industry. For some of these projects we are currently working with forest industry partners. Today I'm going to talk about four particular projects that represent good examples of what we're trying to do to improve the economics and efficiencies for the forest industry, using technologies that we've developed at the INEL for other applications, technologies that are easily adaptable to problems the forestry industry has identified. These four projects cover a range of technologies, from environmental technologies like the biofiltration project and the polyphosphazene membrane project, to increased production through development of plant embryo growth chambers and the development of more efficient energy recovery techniques using some of the plasma technologies we have developed over the years. In this presentation I will give you a quick overview of these four projects.

We are working with an industry partner on the biofiltration project. Our partner tells us they have a problem treating off-gases from their wood drying and composite pressing processes. Their concern is their need to comply with increasingly strict clean air regulations imposed by the state and federal governments, and the high cost of the methods they use now to treat these gases. Incineration, for example, is effective but relatively expensive. To answer this concern, we are adapting biofiltration technologies that we've been developing at the INEL, going after targets like α pinene and methanol, emissions that our partner tells us are among the major problems they have to deal with.

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So what's a biofilter? A biofilter is really a pretty simple thing. It's some sort of container—a plywood box, a drum, a barrel, or a vault in the ground. For that matter, the earliest biofilters were just slit trenches in the ground. The container has to have the capability to hold a bed medium, and the bed medium can be one of a variety of things, including compost, wood chips, soil and sand mixtures, or bark chips. The bed medium also has the property that it will grow a layer of microorganisms in a moist, nonsaturated environment. The microorganisms are selected for whatever you want them to do. In this case, it's oxidizing methanol or α pinene and changing it to carbon dioxide and water. The biofilter also includes some sort of infusion system that introduces the gas flow up through the bed medium, or in some cases down through the bed medium, depending on how the filter is constructed. The idea is to get good contact between the gas and the microorganisms.

We have learned that we can develop these biofilters to be quite compact and efficient. Working in conjunction with the Department of Energy's Office of Technology Development and an industrial partner, we developed a biofilter that is about 4 ft in diameter and about 6 ft tall. This particular biofilter has been commercialized. It's called the Biocube, a designation trademarked by our industrial partner before the final design was out. The final product is actually a cylinder rather than a cube. It consists of a series of stackable modular trays that contain a bed medium, in this case compost. The gas flows in at the top, goes down through the bed medium, and then goes through a plenum that redistributes the gas flow through the next tray. This feature is what makes this biofilter so efficient, because it provides an even flow of gas through the entire assembly.

The modular design allows you to mix and match as much biofilter as you need for a particular treatment that you're undertaking. You calculate how much filter you need based on the load. For example, the 4 ft $\times$ 6 ft unit, designed for gasoline vapors, can treat a flow of about 100 ft³ per minute. Results of laboratory tests indicate that the Biocube can be adapted to applications involving α pinene and methanol vapors.

Another research area we are working in is the development of plant embryo growth chambers. One of our research engineers, Bob Cherry, is the principal investigator. This project, too, is being performed in collaboration with a forest products company. We are developing embryo growth chambers in which you can automatically control the very complex environment that's needed for embryogenesis to take place. We began working with wheat (on the agricultural front, really). Now we are also working with our forest industry partner to produce Douglas fir plant embryos. So we're developing two similar technologies at the same time here.

Biotechnology and genetic engineering typically involve plant cloning. After you develop or select a very desirable plant, by cloning that plant you can maintain its desirable properties, whereas through normal mating procedures you might lose those properties. You take a tissue sample from that plant, typically meristem, put it in an embryo chamber (a little box with a controlled environment), and run it through a process called embryogenesis, which produces a mature embryo. The embryo then further matures into the seedling to be planted. This process of embryogenesis is what we're interested in, because it's a complex process. We have already developed a prototype, laboratory-scale assembly consisting of six embryo chambers. The environment in the chambers is controlled by a computer that uses a variety of pumps and valves to regulate the hormones, pH solutions, oxygen, and nutrients needed at specific times for embryogenesis of that particular species to take place.

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Another area that we're working in is the development of plasma techniques for energy recovery from black liquors. Peter Kong is the researcher who is working on this project. We are adapting some of our plasma technologies to produce a system that will reduce the amount of energy that pulp and paper mills spend recovering energy from black liquors. This system has the potential for low capital investment and maintenance costs, and at the same time it has the potential to reduce toxic emissions like nitrogen oxide in the off-gases. However, the really important feature of the process we are developing is how it improves the energy recovery from the black liquors.

Recovery of energy from spent liquors is vital to the pulp and paper industry, so you need to do that in an effective and efficient way. The black liquor produced by the kraft process comes out diluted, at about 15% solids. With conventional methods, this diluted solution is run through a series of evaporators and concentrated to about 80% solids. The evaporators depend on an energy-intensive process that uses purchased energy, in the form of coal, gas, oil, or whatever. At 80% solids, the spent liquors are sent to a boiler and burned for energy recovery. The smelt that comes off the boiler is due to emissions of sodium sulfite and sodium carbonate; these chemicals are run back through a regeneration process and recycled. Associated with that process is a line kiln that is very energy intensive.

With the plasma process we are developing, we'll start with the weak 15% solids black liquor and run it through an evaporator that takes it only to 58% instead of 80% solids, so there's an energy savings there. Then we run it through the plasma process, which generates a gas that can then be burned very cleanly, producing no NO_x emissions. Also, since you're generating sodium oxide and sodium sulfide, you can eliminate the line kiln. So you're saving significant energy with this process.

The last research area I'm going to talk about is research being done by Eric Peterson in developing polyphosphazene membranes to separate organic chemicals from aqueous waste streams. As with any membrane, the idea is to allow water molecules to pass through, but not the larger molecules typical of organic compounds. One of the advantages of polyphosphazene is that it has three basic structures, and you can mix and match these structures to create whatever membrane you want. For example, we used one of these membranes to separate methylene chloride in a 1% solution, and we concentrated the solution 10,000 fold.

That's the last of the four projects that I wanted to talk to you about today. Thank you.

Energy

**Larry Crowley, Vice-President, Strategic Planning, Idaho Power Company—
Energy Industry Panelist**

This morning I'd like to talk to you about a case study of a utility trying to integrate and actually market renewable technology on a commercial, viable basis. The technology is photovoltaics (PV). The main message is that Idaho Power used PV systems to provide electric power to customers in remote locations at a savings over traditional means of power distribution.

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About four years ago, as we put together a strategic plan, we realized that the likelihood of our building new hydroelectric facilities in the state of Idaho or anywhere else in the northwest was very limited. We needed to find some new, cost-effective technologies that would provide us the opportunity to serve our customers and meet their needs. We began to examine renewable technologies that we felt would make a difference and would be available to us in our service territory. We looked at solar, wind, biomass, and some others. We focused on the PV technology because the State of Idaho actually has excellent tax breaks for solar installation. In fact, they're comparable to the solar resources that are available in most of California. So we began to examine the commercial issues, the manufacturing issues, market studies, and so forth. Fourteen months after we completed those studies, we put together a pilot program, which I'd like to describe to you, to give you some idea of how we're doing and where we think we can go with it. Before I do that, I'd like to tell you about Idaho Power Company.

Some of the highlights for our company in 1994 are as follows:

- We had revenues of \$44 million, tied to the sale of electricity and other services
- We have a total plant investment of \$2.4 billion in all the facilities that we own: generation, transmission, and distribution.
- We had plant additions of \$107.7 million, adding to our investment to keep up service and reliability levels to our customers.
- We had total energy sales of 14.5 million megawatt hours (MWh), of which hydroelectric generation was 6.2 million MWh, and thermal generation was 7.2 million MWh.
- Total customers that we serve are now 333,319.
- We added more new customers than any other year in the history of our company, principally here in Ada County because of the growth that's going on here in Ada and Canyon Counties.

Idaho Power owns and operates 17 hydroelectric plants located on the Snake River or its tributaries. We have retail and wholesale services that we provide in the state of Idaho, eastern Oregon, and a small portion of northern Nevada. We are also co-owners of a number of coal-fired power plants: the Jim Bridger Plant in Wyoming, the North Ogden plant in northern Nevada that's co-owned by the Sierra Pacific Power Company, and the Boardman plant in Oregon. All of these plants meet or exceed Phase 2 Clean Air Act amendment standards for SO_x and NO_x emissions.

I'd like to talk to you about how a regulated utility like Idaho Power introduced and marketed a new technology on a basis that would make money. First, we think it's vital to stick to basic principles: this was not to be an R&D project, it was to be a business offering, a commercial offering, to see if we could find a market niche and to fill that niche with a technology that made sense and could be used in cost-effective applications. One thing you may not be aware of is that the electric utility industry is probably the last of the regulated industries that will be dealing with deregulation and competition. I believe that in the near future, U.S. customers will, be able to

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choose their supplier of electricity and other related services. As we prepare for that, it's important that we think in terms of customer service. You may say that sounds a little strange coming from a utility, but it's true. We have to become better at knowing what our customers really need and what services we can provide that are a real benefit to them.

The results of a number of regional and national public opinion surveys regarding electric utilities show that no company can expect to operate profitably in the long run without public approval and political consent. Simply, it means that the expectations of the customers and communities that we serve are increasing, particularly as it relates our stewardship over the environment. Sixty-six percent of the people polled in a nationwide public opinion survey in 1994 by Cambridge Research Institute indicated they expect their utilities to be environmentally conscious and to do something that will improve the environment. If they do that, there's going to be greater customer loyalty to that utility than there would be if there was no perceived environmental stewardship. That's something that strongly affects how we operate, maintain, and work our hydro facilities, and it continues with some of the new technologies that we're trying now to introduce.

A number of other utilities are buying from us the outline of our business plan for the introduction of PV systems. Some very large utilities, including Southern California Edison, one of the largest utilities in the United States, purchased from us the outline of how we put together this plant. In addition, five other utilities are purchasing the outline: Nevada Power, City of Los Angeles, one from Canada, and a couple of others. There is a role for the electric utilities today in expanding their service offerings to customers and providing new technologies that in the past were not available or were too costly.

Some of the basic elements or strategies that we looked at and continue to examine are identification of cost-effective venues and niche applications. Keep in mind that PVs convert sunlight into electricity; it's a silicon-based technology. It's expensive to manufacture and it continues to be more expensive than most alternatives today, but it has some applications and some very good niche markets. Those markets are the ones we are focusing on today in the hope of expanding the markets, creating new markets, lowering costs, and developing a cycle by which this technology will be as commonplace in your homes in the future as a TV set or a personal computer. In our view, there's no reason why it shouldn't be.

The next item in our strategy is environmental compliance and risk avoidance. That simply deals with environmental issues, and diesel fuel is one good example. In some of the wilderness areas here in Idaho, it's very difficult to get fuel in for local generators to operate and provide electricity. Risk avoidance really deals with financial and environmental risks. It was one of the issues that came up earlier this morning; in fact, Dr. Ledbetter was talking about the costs of getting three-phase power to various outlets in the Snake River. It is very expensive to run distribution transmission lines anywhere today: it takes time, and the materials, labor, and maintenance are expensive. So what we're trying to do is supply self-contained PV power systems designed in accordance with specific needs of the customer at a cost that's actually less than it would be to run a distribution line. PV systems provide power without the environmental risks associated with diesel fuel.

In fact, one good example is one of the first projects that we did. In Jordan Valley, Oregon, a rancher by the name of Bob Skinner needed to get some water to an area where he wanted to

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move about 600 or 700 head of cattle. But it would take about 2 miles of distribution line to get to his property at a cost of about \$40,000. That's a cost that he would have had to pay. We went to him with the idea of putting in a PV tank pumping system that would provide reliable service at a lower cost. He had never seen this before and wasn't familiar with it, but as we worked through it, designed it, put it together for him, and had it running, he went ahead with it. That system, at the time that we became commercial, was the largest solar power water pumping system in the United States. It's a 3-hp pump pulling water from a depth of 310 ft, pumping about 10,000 gallons of water a day. He put in a holding pond so that in the event there are storms or cloudy days and the system doesn't operate, he's got storage. He doesn't have to worry about batteries or backup generators.

Some other basic strategy issues, resource assessment and confirmation activities, are simply doing your homework to make sure that there is a potential for a market, that you can meet it, and that you can respond to the needs and expectations of the customers once those needs and expectations have been created. Regulatory treatment is vital concerning the point of view of any regulated utility, and we were very fortunate here in Idaho that we had a strong support for what we were trying to do from the Idaho Public Utilities Commission, as well as the Oregon PUC and the Nevada PUC.

A quick summary of our pilot program is as follows. We began the pilot project in January 1993 with a commitment from the officers of Idaho Power Company to allocate up to \$5 million in investment in solar power PV systems, with a qualifier that no one system exceed \$50,000. This allowed us to spread the money out and get as many systems out as possible. Service under the program is no different than any other service that we are currently offering our customers in that it is a service defined in terms, conditions, and rates established by tariffs set by the PUC, approved by them, and subject to change only by going through the commission. The tariff offers what we think of as fairly basic electric service for small loads at remote sites. Again, keep in mind the cost of getting to some of these isolated areas with expensive distribution lines, or the cost to those sites that are using fossil fuels and standby generators. In all cases that we have explored, the PV alternative has been very cost effective, both for the customer as well as for Idaho Power Company.

In 1994, we made significant operational and technical improvements to that tariff. Those improvements were actually based on feedback that we got from our earlier PV customers, and we continued to modify it to make it more customer friendly, to make it easier for the customer, and to share some of the risks associated with cost of these facilities. Customer comments helped to identify obstacles to customer acceptance of PV systems, the technology, and the tariff price increase. Responding to these comments has been very positive; I think it has led to real improvements in our program, and I believe it will lead to broader acceptance of the technology and its application.

Today we have seven installed systems; all are operating as designed. They're operating in accordance to the designs that we had taken to our customers. We have one PV system located at Mountain Home Air Force Base. We are just now finishing the installation of that system. This is one of the nation's largest hybrid-solar powered systems, and is valued at \$1.2 million. This was not our intent at the time we began to explore providing PV services; we had really thought we were going to keep our businesses to smaller systems: stock wells, residences, cabins, security lighting, alarm systems, fairly small applications in remote locations. But what we're

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finding is that there's actually a need for larger systems at remote locations. There is a radar station located about 40 miles south of Mountain Home in Grassmere. There aren't many options for them. They're running diesel out there in truck load after truck load, and they can't keep up with it. So we did a study looking at the feasibility of applying PV technology in conjunction with their existing diesel generators. We found that we can actually save them money by lowering the operating costs of those diesel units in using PVs in a hybrid solar system. It's part solar and part diesel.

Based on our activity with PVs (and we have not been just marketing here but we have been exploring strategic alliances with business opportunities outside of our service territory and in fact throughout the United States and the world), we have been selected by the International Energy Agency in Paris to host the next International Executive Conference on Emerging Business Opportunities associated with PV power systems. We would like to invite you and Vice President Gore to be here in September, from the 17th through the 20th, in Sun Valley, Idaho. We're going to have representatives from utilities, PV industries, and government and energy entities from all over the world coming to Idaho to participate in a conference whose theme is, how can we plan for and shape the growth of this technology, not only here but throughout the world. The energy needs of the world are growing exponentially. This is a technology that's growing 15-20% a year. We try to participate in it; we plan to encourage it and to use whatever resources we have to accelerate it.

William Thielbahr, Director, Program Formulation Development Division, DOE-ID—Energy Technical Panelist

Energy resources, both renewable and nonrenewable, are among the most important natural resources of our planet. One of the five business elements in the U.S. Department of Energy's planning is devoted specifically to energy resources. Sustainable use of energy resources can be defined as the indefinite meeting of demands for energy resources at socially acceptable economic cost and environmental impact. While we know that achieving sustainable use of energy resources is not solely dependent upon technologies, we do recognize that environmental technologies are essential. This morning I hope to give you a brief overview of this nation's energy consumption patterns and a highlight of some of DOE's funded activities that address this desire for sustainability.

DOE's programs that support sustainable development address both the supply side (production) and the end-use side (consumption) of energy resources. On a supply side, the program seeks to identify the magnitude of domestic energy resources and to developing and deploy systems to more efficiently extract, process, and deliver them for ultimate end use. On the end-use side, the program focuses on developing and deploying more efficient systems for converting these resources into more useful energy forms, things that we relate to very quickly: heat, light, and power. Common to both the supply side and the end-use side are DOE's activities to stimulate public acceptance and use of these environmental technologies, considering all forms of energy: oil, natural gas, coal, solar, wind, geothermal, biomass. Since its creation in the late 1970s, the DOE has supported research, development, demonstration, and deployment of many advanced energy conversion systems specifically targeted to the needs of the three major sites of energy use: industry, buildings, and transportation. It is DOE's desire to provide value to

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the taxpayers in terms of a stronger and more efficient economy, a more secure energy future, and a cleaner environment.

A significant portion of our gross national product is involved in energy. Of the total energy used in this country, fossil fuels dominate. Fossil fuels also dominate in terms of emissions produced. The three end uses—industry, buildings, and transportation—consume approximately equal shares of our energy resources. Physical laws and economic considerations make it impossible to achieve 100% efficiency, but the process of converting raw energy resources into a usable end product—heat, light, power—can be made more efficient with better technologies.

Between 1993 and 2010, it's estimated that there will be a 19% growth in primary energy use in the United States, mostly in the industry and transportation sectors. Increases are anticipated in the consumption of petroleum, natural gas, and coal, with surprisingly little increase in electricity consumption, because of efficiency improvements and perhaps some market saturation. The continued increase in oil imports is most troubling in the U.S. Some have called it the silent crisis. In 1993 the U.S. set a new import record; crude oil imports were almost 2% higher than what they were in the last record year. That's not good news. Imported oil was responsible for almost 40% of our 1993 foreign trade imbalance. Oil imports are on an upward trend, with predictions that our net import levels will rise to 60% of our total use in 2010. The sector primarily responsible for this increase of oil consumption is the transportation sector, increasing 14% since 1980.

Population growth is a major global issue that will dramatically impact world energy demand. By 2010, just 16 years from now, the world energy consumption is expected to increase by as much as 50%. Unless changed, these energy consumption patterns do not bode well for our planet's health and well-being. The Economist magazine has said that the production and use of energy causes more environmental damage than any other single human activity. What energy resources we choose in the future and how we use them must take world population growth into account.

These unpleasant trends and statistics are drivers for the opening of a huge world market for nonpolluting, energy-efficient technologies. Recognizing these needs, the DOE is a partner for the U.S. companies in support of research and development, to help bring down the costs of renewable energy systems. Over the past several years, the costs for photovoltaic, wind, geothermal, and biomass technologies have decreased significantly. This does not mean that these systems are economically viable today. However, these trends are clearly in the right direction, and they do bode well for our energy picture.

As I stated earlier, DOE's programs are focused directly on achieving a more secure energy future, a stronger more efficient economy, and a cleaner environment. The broadest measure of the success of these programs is the national implementation of the results of these programs. Therefore, DOE's major programs involve collaborations. We seek collaborations with states, trade groups, industrial developers, and commercial developers. Many of these activities are cost-shared with DOE. Collaboration involving universities, labs, and the private sector are particularly attractive to DOE as a means to achieve a greater diffusion of information and a wider application of results.

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Now I'll briefly describe a set of technology programs that address this broad spectrum of DOE involvement.

- The climate challenge. This is a partnership between DOE and utilities to reduce greenhouse emissions. Efficiency improvements play a big part in that program.
- Clean coal technology. Devising ways in technology in burning coal to utilize coal more efficiently, especially in power generation.
- Renewable energies. A whole variety of programs within the DOE, including wind, hydro, geothermal, and solar, including photovoltaics.
- The motor challenge. A relatively new DOE program which showcases industrial demonstrations of high efficiency electric motors in real settings. The importance of this program lies in the fact that conventional electric motors consume a large amount of energy.
- The clean cities program. This program seeks to promote more use of alternative-fueled vehicles in city fleets. I'm hoping that Boise, who is currently a candidate, will join the group of some 50 cities that already are participating.
- Vehicle research and development. A lot of effort is being invested in making the automobiles and trucks that we drive more fuel efficient.
- Fuel cells. A clean device, in terms of its emissions, for producing electricity. Considerable effort is being invested in looking at these as power supplies for transportation and stationary power applications.
- Industries of the future. This is a relatively new effort where seven selected industries are looking at their future plant needs, defining those needs reasonably well, and then looking at the technology requirements that need to be addressed today in order to meet those needs. The forest products industry and the pulp and paper industry is one of the seven industries involved in this program.

Having been with the DOE since its beginning, and on the eve of so-called retirement (which sort of makes me a little dangerous up here), I can tell you that this particular administration is genuinely committed to the sustainable development of energy and other natural resources. I believe that. I see that. I feel that. And we welcome input from the public on better ways to accomplish this. We are eager for that kind of information. Responding to what has become a chronic problem among federal agencies, President Clinton has recently established a high level interagency group to address the coordination of federal programs dealing with critical national problems.

This group is called the National Science and Technology Council (NSTC). It's divided into 9 groups reflecting 9 priorities in this country. The first on the list deals directly with the national resource issue and the environmental impacts. The leadership of this group is made up of the Energy Department, Interior Department, and Environmental Protection Agency. The federal coordination of multi-agency environmental programs is crucial to achieving measurable national benefits, especially in line with current federal funding reductions.

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I believe that unlike previous administrations who from time to time have unsuccessfully tried to do something about this problem, the President's NSTC is poised to make a positive difference. I'm excited about this. I have seen attempts in the past that failed to pull it off. I think this one has a good chance.

I also wish to acknowledge what I consider the courageous and pioneering work of Dr. Clyde Frank, who is one of the most innovative people I've seen in the Department of Energy for a long time. He recognized early on the importance of this interagency coordination, and he set out to do something about it. He has led the establishment of the interagency environmental technology office, which is functioning today with impressive plans for rapidly commercializing emerging environmental technologies. Getting these technologies into the market place is the bottom line of success. With this kind of leadership and vision coupled with the more efficient use of federal funding, I am hopeful that this country will adjust to a sustainable energy economy without adversely affecting our quality of life.

Environment

Tom Haislip, Manager, Water Business Line, CH₂M/Hill Company—Environment Industry Panelist

My background is in engineering and business. I remind you of this to warn you about my personal fixation with numbers and the bottom-line financial orientation with which I tend to view the issues that we will discuss at this conference over the next couple of days.

With that background, let me begin by sharing some important numbers that affect every one of us. I realize that you probably know a lot of numbers behind the concept of sustainable development. You probably believe they are important or you wouldn't be here. But it's less often clear how these statistics form the economic framework that will shape the future of American business, not just environmental technology businesses like the one I lead, but the manufacturing and processing industries we serve; indeed, the entire private and public economic structure of our nation. The population of our planet now stands at roughly 5.5 billion people. All 5.5 billion of us manage to survive on a land area of about 58 million square miles. Of the 5.5 billion people that inhabit our planet, the majority live under frightening economic conditions. Indeed, more than 1 billion of our fellow humans survive on a GNP that is less than \$1 a day. The level of global economic and industrial growth needed to meet even the most basic needs of our present population is enormous.

Secondly, the experts tell us that over the next 4 or 5 decades, the world population will reach 10 billion. To provide even the most basic living standards for the twice-present-size population will require global economic and industrial development that is 5 or maybe even 10 times today's level, depending on how you define basic living standards. While all this population growth and industrial development is racing along, the land surface of the planet is still 58 million square miles. More than any other fact or statistic that I know, the simple realization that the land, water, and air allotted to our endeavors on earth will never expand tells me that sustainable development is not just a theoretical notion. Whether it be in the cost of products and services that we use or sell, the quality of our lives, or in the harsh consequences of disease and starvation, every person on this planet has a personal stake in the successful melding of our economic and

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environmental aspirations. In plain economic terms, it means that we either find a way to manage the sustainable development of our finite world or our finite world will be increasingly manage us. All this tells me that the technology for that sustainable future will be a fundamental basis for future economic development, and successful innovation that advances that technology will increasingly define the competitive management of companies and of countries. It tells me that our economic future as businesses and as a nation will depend on getting this right.

Let me state emphatically that I am an optimist about what this means to all of us. I firmly believe it's within our power to meet the challenges of a sustainable future, including its economic promise for our children and grandchildren. The key to a sustainable future is through the cooperative and coordinated efforts of private enterprise, government, academia, and public interest groups to shift to new technology trajectories that focus on tomorrow's needs, not yesterday's, so that we will be competitive in tomorrow's marketplace. These trajectories must be based on new alliances that can break through the long-standing and adversarial paradigms that needlessly divide us.

One reason I'm optimistic about our collective future is the mounting evidence that those critical alliances are already taking place. Here in this country, a clear trend in industry is to find common ground among business, public, and environmental interests. You see it in linkages like Georgia Pacific and the Nature Conservancy, who have moved beyond past differences to work jointly to preserve critical habitat and provide for long-term stable business growth. You see it in breakthrough conceptual innovations like wetlands banking that protects and extends wetland preserves while accommodating vital work and shoreline development. You can see it in the new generation of manufacturing processes that have environmental considerations designed in them from the start. As time goes by, the critical alliances and paradigm shifts that will be needed to achieve the desired sustainable future will become more the rule than the exception.

Besides current trends in forming alliances between governments, business, academia, communities and public interests, I also take heart in history. Anyone who grew up in America's heartland as I did knows what a constructive force joint initiatives can produce by looking at the results of our nation's rural electric program. In that case, we see that the combined efforts of government, private enterprise, and empowered citizens can not only sustain their own communities, but in the process feed a hungry world. Cynics will argue that while it may have been possible to approach issues from such a shared community perspective at one time in our history, our current combative political and economic situation will no longer support such an approach. After years of regulatory feuds and skirmishes, is it reasonable to think that government, industry, and civic institutions can work in concert to achieve a long-term prominent goal for good? I suggest that a lot of it is happening right under our noses and perhaps even on a grander scale than before.

Years from today, I expect someone to address this audience at an event such as this and reflect on the profound impact that NAFTA and GATT made on sustainable development, and here's why I say that. Today, companies such as the one I lead are finding opportunities to share and apply environmental technologies with Mexico and Latin America in ways that didn't exist before. By dismantling long-standing trade barriers, American environmental expertise and technology combined with global financial resources and a more empowered local citizenry are taking monumental steps toward environmentally responsible economic development. Think for a moment what that could mean. If delivering electrical power in America's breadbasket could help

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feed a hungry world, what would it mean to provide a new generation of industrial ecology and environmental technology to the economic development of Mexico and Latin America. For any one of you who have ever traveled to Mexico and have been cautioned, don't drink the water, think of the profound changes that lie ahead.

But this is about much more than that. It's about a whole new global economic composition. Last summer I participated in China's Agenda 21 conference, which was aimed at setting a sustainable development framework for that nation in a new millennium. Elsewhere around the world the story is the same. This new global composition in the U.S. has much to contribute technologically, economically, and environmentally. We have many strengths, technical know how, application experience, services, and products. These strengths have been gained through both the successes and failures in dealing with our national environmental agenda. But still it's my strong sense that we do not yet have it together, to deliver the full potential at home as well as abroad. The best analogy I can draw is that of an orchestra: as a nation we have an impressive array of excellent musical instruments and some truly outstanding musicians. What we are still missing is the orchestration, the right down beat to set the economic symphony in motion. To me, this conference is about shaping that orchestration by developing sound policy and public and private partnerships.

To get the job done will not be easy. Companies that have grown out or evolved under such a command and control, regulatory-driven market place will have to learn new ways of doing business. But if we fail to respond to these new economic realities, we will ultimately be replaced by those who have learned their sustainable future business lessons.

At the beginning of this address I made a point that my engineering and business background leads me to a hard numbers view of sustainable development. Let me leave you with a different look at the numbers I cited earlier, sharing a more personal way to drive my point home. When I shared the numbers concerning population and economic growth, the statistic I found most compelling is the one that one billion of our fellow human beings currently exist on less than \$1 a day. I draw that bit of information because I know that if we unleash the full force of American's environmental and technical know how, we can have both good business and a most immediate and profound impact on the people among us who still struggle for a day-to-day existence.

This point came to me personally during a recent visit to Cairo, where our company provided engineering services for Cairo's new water system. As I toured the city's new water facilities on the hilltop in the oldest part of town, I looked down across the ancient city and was deeply moved. The numbers, projections, and data took on a different significance as I glimpsed the old homes and ancient mosques. From that vantage point, it suddenly dawned on me that for the first time in the history of that great civilization, many of the people living there would soon share an experience that we all take for granted, the experience of turning on clean, running tap water in their homes. At that moment, sustainable development in human terms was never more clear to me. As a people, as a nation, as entrepreneurs, as environmental advocates, as teachers, and as civil servants, we have many such inspiring moments in store for us as we join together to chart our new technical trajectory for a sustainable future. This conference is a magnificent opportunity for us to help share and shape how we as a nation will participate in a future global economy in which technology for a sustainable future will be the key competitive differentiator. It's our chance to help build a bridge to the vision outlined by Vice President Gore. As I'm sure

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is the case with all of you, I'm committed to making this happen; more importantly, I'm convinced that we will see that it gets done.

Kathleen Hain, DOE-ID—Environment Technical Panelist

I'd like to talk about the interface between the federal government and technology development and use, because it's very complex. The federal government is a developer, a user, and a regulator of technologies. As such, the federal government strongly influences the evolution of the technologies upon which our industrial technology is based. The government has been involved in the use and control of hazardous materials from the very beginning. When General Washington and the Colonial Army spent their long hard winter at Valley Forge, they melted a lot of lead.

The federal government has been the principal source of funding for technology development for at least the last 50 years. The government provides grants to universities to develop technologies. The government supports numerous national laboratories. As we all know, DOE sponsors a number of these laboratories. In addition, the Department of Defense, the Department of Transportation, the Environmental Protection Agency, and the Department of Agriculture each have their own laboratories, all involved in the development of technologies. The government also provides contracts to industry and has partnerships with industry.

If we recognize that the government is funding, developing, using, and regulating technologies, it becomes very obvious why there needs to be a more effective public/private partnership. There is no doubt that the government is currently regulating the use of technologies, both directly—for example, EPA's system of "best demonstrated available technologies" (BDAT), which apply to water and to the treatment of liquid wastes, but also indirectly—the clean air and clean water regulations actually determine what technologies we use in all of our natural resource development processes. Taking this a step further, we also have OSHA, which totally regulates the way in which we can do business.

A number of years ago I worked as part of team that went down to historic Williamsburg, Virginia, with the task of bringing all the crafts demonstrations into compliance with OSHA. There is a lot of popular nostalgia for the pre-industrial 17th century, but if you look at the critical technologies—carpentry, metal working, leather making, glass making—they all involve hazardous materials, and they all involve processes with risks that are no longer considered acceptable.

Much of the regulation has been delegated to the states. If you are a technology developer, this can be good because it allows you to select technologies that are specific to the environment and the economic conditions of the particular state. On the other hand, state regulations can cause you difficulties if you have to get permits with agencies from several states. This trend has already been countered by groups of state agencies getting together and trying to develop test plans that will allow for one permit across state boundaries. It hasn't happened yet, but it's on the way.

During the past 10 years, the Department of Defense has integrated all of its funding for technology development across all the services, and DOE has been coordinating with the

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Department of Defense. The purpose of this integration is to reduce any duplication of effort and to try to make sure that technologies already developed by one agency are used by the others. The EPA has been providing that plum.

Recently, federal technology development funds have been directed towards the federal problem, because the federal government must eventually come into compliance with all the same regulations and all the regulatory framework that industry must comply with. Most of the federal problems are just simple industrial problems, so perhaps the current emphasis is not inappropriate. In recent years, the emphasis has been on removing volatile organic compounds from soil and groundwater, removing heavy metal contaminants from soil, controlling the release of volatile compounds from industrial processes, the recycling of materials during processing, and finding markets for the reuse of materials.

Western state governors, responding to some of these trends and recognizing their authority, met with the White House three years ago and developed an interactive initiative. This initiative is now usually referred to as "Do It." One of the purposes of the initiative was to provide early input from the stakeholders into the selection of technologies for development, so that the selected technologies would be more likely to be accepted for actual use in the western states.

DOE has used its sites as demonstration areas, as test beds, for industrial technologies developed by industry. What this really does is move the liability for the demonstration from private industry to the federal government; the federal government has deep pockets, and it has the same problems as industry. This practice allows for demonstration in a place where the responsible party cannot go bankrupt and cannot walk away from the problem. The EPA has taken this idea further; they currently have five demonstrations in which industry itself selected the problem, the site, and the system which is being applied. However, these demonstrations, too, are located at federal sites.

Federal funding of private efforts gives special preference to small businesses to develop solutions to federal environmental problems and provide jobs. Typical programs fund up to 50% of costs. The preference for small businesses may represent a shift of liability from large businesses to smaller businesses. Smaller businesses don't have such deep pockets, and if the technology under development is successful, it has been our observation in the last five years, that the successful small business is purchased by a larger business.

When business talks about its interface with government, they talk about the slow speed of contracting. This is an especially significant problem for small businesses, who usually cannot finance a wait of nine months for a contract to come in. They also talk about the status of intellectual property. Who owns the technologies that are developed with federal funds? If you talk to the entrepreneur, he will strongly hold that his ideas and his brainpower were the important elements in the development of that technology, and that he should own it and profit from it. But as a taxpayer, I sometimes wonder what the role of the federal government is and what the reward for taking those risks should be. Another issue: do federally supported technologies get special preference with application to federal sites? If you are an entrepreneur who had federal funding, you'll say no. If you are an entrepreneur who did not have a federal contract, you may feel really strongly that your federally funded competitors have a significant advantage because of their connections. Their ability to talk with the federal officials who are going to make the selection is seen as an unfair advantage.

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Who actually wants the technologies that are currently being developed by the federal government? In the area of paper, for example, well, everyone uses paper. There's definitely a market for it. But in the area of industrial and environmental technologies, the market is driven by regulation. If the regulations change, will there be a need for a corresponding technology?

Federal employees rarely actually clean up a federal site. They issue a contract to a company like CH₂M/Hill, who does the clean up and manages the materials. It's a company like CH₂M/Hill that has to select the technologies that are going to be used. If we look at the current set of environmental technologies being supported by the federal government, we see an emphasis on reduction of life cycle costs. However, many of the technologies that reduce life cycle costs actually have a higher initial cost. In an era of reduced budgets, where each year there is less money to spend, there is some question whether the high initial cost is worth the long-term benefit.

The selection of technologies for resource management must address the management of hazardous materials. It is a fact that hazardous materials really do need to be managed. They are part of our economy, and it is wrong to try to simply get them out of sight. The selection of technologies has to focus on the disposition of materials, determining where and in what form hazardous materials are going to be disposed of. This is one of the major problems in technology development, because we have to understand the risks, the geology, the hydrology, the waste chemistry, and the politics to make the right selection of technologies for federal funding in order to return an investment on the taxpayer's dollar.

5. Panel on Infrastructure for Sustainable Development

This section of the report contains addresses given by the panel on infrastructure for sustainable development of natural resources. The panel helped to frame the immediate context for the focus group meetings that followed. The panel consisted of representatives from academia, banking, the Western Governor's Association, the office of the Governor of Idaho, the Idaho Operations Office of the Department of Energy, and the Shoshone-Bannock Indian Tribes.

Ginger Swartz, Western Governor's Association

As the agenda indicates, this portion of the conference proceedings is dedicated to the introduction of improvements to existing infrastructure that might have the potential to advance the deployment of environmental technologies. The example I would like to talk with you about today is directed towards increasing the flexibility of the regulatory structure and to reducing regulatory barriers to the development and commercialization of environmental technologies.

In December 1992, the western governors and the secretaries for the Departments of Energy, Defense, and Interior, along with the administrator of the Environmental Protection Agency, formed a federal advisory committee tasked with identifying, testing, and evaluating new and more cooperative approaches to deploying promising alternative waste and remediation technologies at federal waste sites in the western United States. The effort was at that time named the central advisory committee to develop onsite innovative technologies, known as DOIT. The purposes and goals of DOIT are incorporated in the Memorandum of Understanding and the Federal Advisory Committee Charter. All of these five goals are very important for focusing this effort and for remembering what the overall purpose on a regional basis is for this project.

The first goal is to encourage cooperative efforts in research, development, and demonstration of cost-effective environmental restoration and waste management technologies on western lands. Second, the development of interagency, government, and public information exchange related to waste management and environmental restoration. Third, interagency and intergovernmental and public cooperative strategies to assess the effectiveness of new technologies. Fourth, the development of regionally integrated approaches to identify solutions to problems related to permitting deployment of these technologies. Finally, the development of pilot projects to test new models for public and industry involvement in testing and evaluation of the promising innovative technologies.

Three main specific product assignments were attached to these goals when DOIT was incorporated. Those were, first, the identification and listing by priority of waste management research, development, and demonstration needs of federal facilities in the west. Second, the identification and assessment of emerging waste management and environmental restoration technologies as well as the identification of barriers and regulatory issues related to the effectiveness of the technology selection process. And third, the identification of the most pressing waste management problems at federal sites in the west. In other words, if we look at DOIT, we're looking at something rather process oriented, and it directly focuses on process enhancements to existing research, development, and demonstration and strategies.

The demonstration selected for the phase one DOIT project had to meet a large number of criteria, including having already gained access to the funding cycle and having the ability to be

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demonstrated within the 3-year timeframe of the DOIT project. In order to accomplish the task outlined in the DOIT memorandum of understanding, the work scope was channeled into four specific project or product barriers. The first was in the area of new approaches to stakeholder involvement and technology selection. And this was divided into two chunks of work, a regional and local stakeholder involvement.

The regional stakeholder effort emphasizes the potential for gaining public acceptance of new technologies on a regional basis. At the beginning of the DOIT project, it was targeted for testing at the Army's Yuma proving ground in Yuma, Arizona. The local stakeholder involvement effort involves the public and development of technology demonstration plans, which was quite an unusual effort and has been proving to be a very interesting experience. DOIT is testing the success of this particular concept at four mixed waste sites: here at the INEL, at the advanced landfill cover at Sandia National Laboratory at Albuquerque, at the California National Test Site, and at the Black Hills Ordnance Depot in South Dakota.

The multi-state technology certification work area focuses on regional certification of cone penetrometer characterization technology being demonstrated at the Naval Construction Battalion Center in California. The deliverable for this particular product area will be a model regional technology cooperation process. The cost and performance data area was identified for the purpose of developing independent and verifiable mechanisms for explaining demonstration results that might in the future lead to faster consideration of the same technology at a different site. This enhancement was initially identified for testing at McClellan Air Force Base soil vapor extraction demonstration near Sacramento, and also in relation to the multi-state evaluation of biosite and technologies at the FMC gold mine in Nevada. Hill Air Force Base in Utah has also been involved in this effort through the Air Force Center for Environmental Excellence Bioment Initiative. And Williams Air Force Base near Mesa, Arizona, has been participating in the multi-state evaluation of horizontal versus vertical well technologies in containing and remediating petroleum-contaminated groundwater.

The deliverable for the DOIT cost and performance data product area is going to be a model cost and performance reporting format and model technology demonstration CD ROM reporting format. The multi-state technology permitting cooperation effort is our major work focus for the second phase of DOIT, which just began in calendar year 1995. It's geared towards developing appropriate information in the course of demonstrating new technologies in one state that might assist in gaining faster permit process and reviews of those same technologies in another state. This is what is referred to as regulatory reciprocity, although the regulators accuse us of using two "R" words in a row when we use the term, so we're now calling it interstate technical and regulatory cooperation. This enhancement is being tested at Rocky Flats at Golden, Colorado, through the thermal desorption technology demonstration and also in Idaho at the INEL Fixed Plasm Work Process demonstration.

On February 7th, an initial scoping meeting for the interstate technology and regulatory cooperation subgroup to the DOIT project will take place in Denver. The group will consist of western states that have already been participating in the DOIT effort along with a number of states outside the western region. We're very excited about this meeting. The purpose of the group's meeting will be to discuss the opportunities and limitations for interstate cooperation, testing and development, and permitting. Areas of potential cooperation to be discussed at this meeting include the sharing of performance data, multi-state permitting, standardized evaluation

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protocols, standardized data acceptance criteria, joint participation in demonstration projects, and standardized costs and performance data.

In direct relation to this February 7th meeting, over the next 18 months, western states will test the three-faceted interstate regulatory cooperation model that we hope will lead to faster permit reviews for demonstration and testing of new technologies. The first piece of this interstate regulatory cooperation model is focused on joint permit development. This type of cooperation, we envision, will be used for complex types of technologies that have limited but important uses. An example of this might be technologies for treating certain mixed radioactive and hazardous wastes that are found probably in only two or three DOE sites in the country. For these particular kinds of technologies, we envision that regulators and the stakeholders in the affected states will get together to jointly design a demonstration permit that will meet all the states needs on that particular waste problem.

The second facet of the interstate regulatory cooperation model is focused on common cost and performance and testing protocols for new technologies, building on the federal remediation roundtable efforts in California's technology certification model. States will begin using a common format to test and report cost and performance of new technologies to one another. We're hoping this might evolve into a state electronic bulletin board system where states can upload the result of technology demonstrations into a searchable database that other state regulators can use for the same purposes.

The final case of cooperative effort is a permit by rule for certain classes of technologies. Again, this is based on California's technologies certification model. The purpose of this task is to clear up the regulatory uncertainty, reduce cost of entering, and let the market be the judge for some types of technologies designed to solve fairly benign contaminant problems.

In closing, we're hoping that DOIT project efforts will assist in decreasing the confusion and lack of clear standards for site cleanup that have resulted in an over-reliance on proven technologies, little venture capital being invested in environmental technology development, and the resulting technology gap that government and research and development must now fill. To date, technology development efforts have focused solely on science; as a result, we're spending millions of dollars on technologies that don't get regulatory approval or public acceptance and have little cleanup successes to show for the investment. To resolve this predicament, federal agencies should join in developing a national technology verification process rather than trying to go it alone.

The national technology verification process should be based on the following principles. It should provide independently verified data on cost and performance. This means that it can't just be a reporting format that technology developers fill out and mail in. The protocols for generating cost and performance data should require data to be as detailed as necessary to capture the sensitivity of the technology, the site conditions, and other key independent variables, over the range of conditions at sites that will potentially use the technology. Otherwise, regulators and stakeholder groups are going to continue to demand additional site verification and technology performance. The verification system should be targeted at technologies addressing waste in the middle of the hazard spectrum. Money shouldn't be wasted to verify technologies to treat what are fairly benign waste streams. Instead, we should begin to develop presumptive remedies for those types of situations. In addition, we believe we should not spend a lot of

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money trying to verify technologies aimed at the most highly radioactive wastes. Each site will probably want to do additional onsite testing and verification of these technologies because the consequences of failure for such waste streams is so much higher. The verification system should not be designed only by scientists. Regulators and ordinary citizens need to help design the system so that they will understand and trust the results. Finally regardless of the degree to which a verification system is structured and implemented, by government or by the private sector, and irrespective of which agency takes the lead in developing this system, we should agree on common protocols and procedures and on the process for generating one set of data. Thank you.

Thomas Ripke, Executive Vice-President, West One Bank

The subject of sustainable economic development is an old subject among bankers. Bankers have been dealing with this subject for centuries. Our borrowers often tell us that we aren't giving them enough money. We are forcing them to live within their means.

I am reminded of a story about a retired banker. Like most bankers, he wasn't paid real well and his pension wasn't that great, so he had to find something to supplement his income. He bought a little convenience store and gas station. One day a traveler stopped at the gas pump and said, "Fill it up." While the pump was running, the retired banker struck up a conversation with the traveler and found out that the traveler's destination was a town just a few miles down the road. At that point the banker ran out and shut off the gas pump. The traveler said, "Hey, what did you do that for?" The retired banker said, "Well you don't need a full tank of gas to get to the next town."

That's the way we are as bankers. We impose limits to keep people on a sustainable economic basis. This puts the bank in the role of financial intermediary. So how do we get the money into the hands of the people who can implement and use the technology that has been described at this conference, and what can we do to get that technology used in productive ways so that we're in better harmony with the world that we live in? The banking business and most financial intermediaries are driven mostly by one constraining factor; we are required to make what the regulators call safe and sound loans. When we make a loan, we have to be able to demonstrate that the borrower has the ability to repay the loan. The prospect of financing some of these newer technologies is a little difficult for the banking industry, even if there is a tremendous potential for payoff, because the technologies are unproven.

The typical process of making a loan to a farmer, for example, is really a simple process. The farmer comes to us in the spring and tells us what crops he intends to raise. He tells us how much he intends to spend on raising those crops—how much he's going to spend on fertilizer, water, and fuel, what kind of land payment he will have to make, and so on. He also tells us what yields he expects to get from his plantings and what prices he expects to get for the crops he sells. We put a little arithmetic to it, and if the income he projects is large enough to offset the costs, we go ahead and make the loan to the farmer.

The yields that the farmer projects play a big role in the analysis. If a farmer comes to us with a plan to use a brand new kind of fertilizer that's never been tried before, saying that this fertilizer will theoretically produce a quantum leap in his yields, we would have very difficult time

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demonstrating that farmer's ability to repay the loan. On paper it's a great idea, but in reality it hasn't been sufficiently proven. What happens if the fertilizer doesn't produce the higher yields? How is the loan going to be repaid?

In an instance like this, we usually step out of the usual mode of financing and turn to such programs as the Farm Home Administration Loan Guarantee Program. Such programs reduce the risk to the bank. The farmer goes to the Farm Home Administration and says, "This looks like a great idea; it looks like it will work, but there's a little extra risk involved." The Farm Home Administration processes his application and blesses the loan with a partial guarantee. The bank then goes ahead and makes the loan, and we all see if the new technology really does work. A lot of times it does work.

Programs like this are also available through the Small Business Administration for small business applications. Both the FmHA and the SBA are generally limited to financing that might be available for a small operator, whether a small farmer or small businessman. FmHA and SBA will not guarantee very large loans. When it comes to helping the larger businesses implement new technologies, we frequently enter some kind of partnership arrangement. For example, banks have helped companies like Idaho Power implement the idea that the better insulation in everyone's homes is a very sound investment. We and other banks worked with Idaho Power to make home improvement loans available to the public through Idaho Power, so the people could afford to insulate their homes better to save on their heating bills. In the long run, it's a smart thing to do. These loans frequently pay off ahead of schedule, because the consumers find that they are saving more than they thought they would.

We have a similar arrangement with Intermountain Gas to finance the purchase of high technology, new phase furnaces that are far more efficient than existing furnaces. Some important developments have occurred during the last few years in the heating area. Furnaces that were thought to be very efficient ten years are not efficient at all by today's standards. Even though the ten-year-old furnace certainly isn't worn out, it is still economically viable to replace that furnace. The consumer can borrow the money to buy the new furnace and repay the loan with the savings that result from the higher efficiency of the new furnace.

These are just a couple of ways in which the banking industry, as part of the infrastructure, can play a role in implementing new technologies that provide for sustainable use of resources. It's just a matter of figuring out how to educate the bankers as to what it is that has be accomplished and what the payoff is. That's usually fairly easy to do. Bankers are very receptive to this kind of an opportunity, because they can see the benefits of improved economic performance. For bankers, the bottom line is demonstrating the ability to repay a loan. There are lots of ways in which the banking industry can support the objectives being promoted at this workshop.

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Marvin Osborne, ShoBan Tribal Chairman

I hope what I say today will add to the recommendations being taken to the White House. I want to explain my view of what it's like with Indian tribes across the nation as well as in Idaho so far as this concept of an infrastructure for sustainable development is concerned.

As chairman of the Fort Hall Business Council I am pleased to provide input to the White House Conference on Environmental Technology. President Clinton has recognized the importance of honoring the treaty rights of federally recognized Indian tribes. This recognition imposes certain trust responsibilities on the federal government. Equally important, some Indian tribes, such as the Shoshone Bannock tribes, have a constitution and bylaws and a federal corporate charter to provide for a responsible government to promote the general welfare, to conserve and develop our lands and resources, and to secure to the Indian people and to our posterity the power to exercise the right of self-government not inconsistent with federal laws. For the vast territories of the Indian treaty rights, the difficulties of tribal sovereignty and trust responsibility becomes a natural enemy to those entities and industries focusing on business, fisheries, natural resources, agriculture, mining, wildlife, and the environment.

In the past decade, Indian tribes have become more involved then ever before in issues involving the environment and natural resources. It's important that the federal government continue supporting Indian tribes on important issues such as cultural resource management, air quality, and ground water protection, issues that are critically important to Indian tribal governments. I've identified some needs and some issues that I feel are important because they relate to us in real life, they relate to us as an immediate concern.

- We intend to sustain any type of development that occurs on our Indian reservation. The Shoshone-Bannock tribes, as well as other Indian tribes, have an interest in the proper management of DOE sites. The Shoshone-Bannock tribes are interested in DOE's taking all necessary steps to correct mistakes of the past and to protect the environment in the future. This interest arises from the tribe's unique perspective in relationship to the land. The Idaho National Engineering Laboratory itself lies in the aboriginal territory of the Shoshone-Bannock people.
- We feel that DOE's review of environmental restoration and waste management is inadequate. Simply, the primary concern is how DOE proposes to clean up the INEL and avoid creating the same problem in the future.
- We are concerned about DOE analyses of social and economic impacts. In general, all populations affected are assumed to be of similar cultural heritage with similar social/economic characteristics. Indian tribes are not adequately considered, perhaps because they are not representative of the general population in terms of the social and economic conditions that prevail in the region where the impact is being evaluated.
- DOE's approach for analyzing impacts on cultural resources is inadequate, because it minimizes impacts like fragmenting. To Indian tribes, the land itself represents a cultural resource which allows us to enjoy a connection to our ancestral and traditional lifestyle. From this perspective, many kinds of resources—water resources, ecological resources, scenic

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resources, and air quality—are cultural resources. The overall impacts of activities on these resources must be analyzed in cooperation with Indian tribes.

- The future management of spent nuclear fuel is a concern. The Shoshone-Bannock tribes are concerned as DOE proposes to continue its historic practice of moving highly radioactive spent nuclear fuel from the place where it is generated to the INEL under the pretext that the transportation of these wastes is safe and the storage and management of these wastes is secure.
- Possible radiological impacts to the tribes from the transportation of spent nuclear fuel are a major concern to us. The radiation doses related to any one shipment are called negligible. However, what is relevant is the fact that the risk that the general public may be exposed to radiation increases with each additional shipment of spent nuclear fuel to the INEL. And we feel accidents are possible. The tribe needs to be assured that our emergency response capabilities are sufficient to protect our public safety, the environment, and our culture.

The effort of this conference to define a strategy for sustainable use of natural resources needs to look at these issues, because they indicate DOE's failure, in its own programs and at its own sites, to address sustainable development. Identifying these issues and concerns is important to us in terms of where we are and what we have, because this is our home land, and we are never going to move.

The Fort Hall Indian Reservation is the permanent homeland of the Shoshone-Bannock Indian people. The Fort Hall reservation is 544,000 acres of land. It is located 50 miles southeast of the INEL. Our estimated enrollment is 3800 tribal members. The reservation was established by the Fort Bridger treaty of 1868. These treaties represent a supreme law of the land, without conflict with state law, by reason of the supremacy clause in the state's constitution. These treaties create a trust responsibility on the part of the federal government. The Shoshone-Bannock tribes have their own sovereign government recognized by the federal government. This sovereign government has the authority to regulate activities on the reservation, thus establishing an infrastructure for sustainable development through the constitution and bylaws in our corporate charter.

There are several policies and ordinances that we have in place or are working on right now; a few are going to be implemented by 1996. We have a land use policy that controls the character and protection of the reservation—its land, its resources, its minerals, its water. We have a tribal tax code; of course this is meant for economic development purposes. We are in the process of completing an air quality ordinance. That ordinance is there to protect air quality, monitor attainment and nonattainment areas on the reservation, and demonstrate various classes of air quality on the reservation. We are in the process of finalizing our tribal water code; water is a great important resource to any mankind. The cultural resource code that we'll have in place, not only for the Indian reservation itself but off the reservation as well, is definitely needed, and should be included on any type of facility or area. We have a trespass ordinance. This ordinance coincides with the nuclear material transportation act that we developed.

Our development of these ordinances and policies is our response to the impacts that federal agencies, state agencies, and other organizations have on the sovereignty of the tribes. We create these things to protect our sovereignty because sometimes business organizations and government

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agencies break the law. We have tribal employment rights on the reservation for economic development. These rights were used against the Indian people in a large corporate industry. We took this challenge all the way to the Supreme Court and won. It was a victory not only for Indian tribes such as ours, but for all Indian tribes across the nation.

We have a tribal enterprise program. We have a federal corporate charter that implements business enterprises off reservation. These policies can support the Department of Energy's environmental and economic development activities in commercializing innovative technologies.

One of the most important of our natural resources is water. The Shoshone-Bannock tribes have reached one of the final stages of the 1994 Water Sediment Agreement. We have one of the best water engineers available to assist the tribes with their surface and ground water rights. The Snake River plain aquifer system lies beneath the Department of Energy's facility. The technology to develop and monitor a suitable hydrology plan between the INEL and Shoshone-Bannock tribes is within our reach. In addition, the Shoshone-Bannock tribes have been preparing for an analytical testing laboratory on the Fort Hall reservation. This service will test for organic and inorganic contamination for environmental protection and cleanup.

We also have been involved in establishing a hazardous materials training facility. We recently reached an agreement with the ACLU to have them help build the facility at the Fort Hall Indian Reservation for training people to handle hazardous waste material. We think that's a plus for the region and a plus for our area. And finally, Lockheed Idaho Technologies Company at INEL has committed to pursuing the possibility of privatizing and subcontracting support services to the Shoshone-Bannock tribes.

As an Indian tribe representing Indian tribes in our region, in our state, and in our nation, we present our recommendations for the future. The Secretary of Energy, through the President, must continue to support and strengthen the national DOE Indian policy. This policy originated in 1988, when the Shoshone-Bannock tribes were one of two Indian tribes that were invited to develop and implement a policy for all Indian tribes for DOE facilities. So we were one of the authors of the policy. The policy was weakened when the language was changed in a way that watered down the implementation policy. We are very concerned about that.

The Department of Energy must continue to fulfill its trust responsibility to Indian tribes by seeking proper consultation. We support the continued research and development activities with the Shoshone-Bannock tribe and other Indian tribes at each DOE facility. We support a cleanup of the INEL facility and other facilities before more waste is brought in. We see a need to seriously evaluate any impacts this waste storage may have upon Indian tribes' free rights and upon the health and welfare of the residents of Indian reservations. Finally, we encourage people to see the environment, the culture, and the technology through the eyes of the Native American Indian people, and to recognize a holistic approach to implementing the technology to preserve the culture and the environment, now and in the future. I thank you very much for allowing me some time to speak on behalf of Native Americans and on behalf of our tribe.

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Jeff Walker, Special Assistant, Office of Governor of Idaho

Every day we are faced with new "buzz phrases," used to describe new trends and subjects. A recent "buzz phrase" making the rounds through government and industry is "sustainability." The definition of this word is evolving but the general definition is: "Sustainability requires citizens and businesses to conduct activities that will not have a high impact on the future." Various groups may modify this definition, but all agree that industrial, economic, social, and environmental activities impact our current and future circumstances and must be compatible with each other in order not to destroy or diminish one another.

For government to operate in a sustainable environment, it must use a process of "inclusiveness" (citizen groups, government representatives, business leaders, etc.) to develop policy. From a series of meetings and focus groups, government policy directors can develop a map of community concerns and craft long-range plans and policies that help not hinder the progression of the community.

The ability for a community to work together and balance the dynamics of hard science and social, cultural, and economic issues will test its nerves and patience. The fact remains that community demands will continue to grow. Business, government, and industries will need to be responsive to these demands. Government will be in the tough spot of encouraging public input and planning, but at the same time avoiding encumbering free enterprise. Sustainability, as a concept, will continue to evolve as the dialogue continues and as communities and government examine their values and chart their future.

Delores Ferri, Acting Deputy Manager, DOE-ID

It's a real pleasure to be here, and I was struck by the mood here because what we're trying to do is bring down roadblocks, as the previous speaker just mentioned. And I think that this contract, this framework that we've set up will allow us to do this. We were doing this before it became fashionable to reinvent government, so I'd like to talk a little bit what we're about here in our contract. You have to have a vision of where you're going, and what we wanted to do was to get the best of the private sector to come in and challenge the way that we've been doing business, the status quo. Obviously, we wanted to integrate and consolidate our resources because we have personnel systems, five of this and five of that. You don't need five of this and five of that to run a business. We didn't think that was very efficient. But what we were really looking for is for someone to come in and to be in partnership with us, an entrepreneur, to have a business, to do business like business does business. We can do that as a government institution in partnership with an INEL contractor. Again, cost effectiveness. All of us could see what was coming down; we owe that to the taxpayer.

Another part of that is that we have a lot of nifty technology in the INEL, the technology that we've built up through the years. And just sitting in the laboratory, I'm not sure it really gets the full use; we have a lot of dual-use technologies. So what we wanted to do is to be able to take those technologies, of course with our mission, but also look for commercial applications. And what does that mean? That means improve all of our living standards as well as create jobs and create good jobs to be the engine of growth, and we can do that within the Department of

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Energy. Processes are nice, and we're good at processes, but we owe the taxpayers more than processes. We owe you outcomes, and so that's how we have framed our contract.

So what we did was we had a competition. We had three good competitors. We opened up our books. We opened up our data and said, "Have at it, and we want innovative ideas." Again, the bottom line was that we wanted to make a quantum step change, and there are a lot of changes in industry. That is what has made our country great, so we wanted to take some of that genius and bring it to the INEL.

With that, I want to talk about a couple of aspects of our contract. What we're trying to do is how you incentivize. Let me try to talk a little bit about what the difference is between incentive fee and award fee. Award fee is that you kind of outline what you want, but it's in a very subjective factor. We want better this, better that. And then we grade you, we grade the contractor on some subjective performance. What we think is a better way of doing this is to be objective.

Let me give you an example of this. I used to live in Washington D.C. for many years, and there was a bridge called the Woodrow Wilson Bridge between Virginia and Maryland. It's got the most horrible traffic in the world, I think. They had to fix this bridge, and they told the contractor, go fix the bridge, but if you do it sooner, if you do it faster, if you do it better, you get a little extra fee for it. And you know what? That bridge was done sooner and faster and better, and we also saw it in California after the earthquake. To get challenging goals, to have output-measurable goals, and then let the contractor be free to go do it, that's kind of how we set up our contract.

Now, again, we're making a revolution within the department, and that's one of the reasons the secretary came out here is to recognize the INEL and all the innovative things that we're doing. What we're doing is ramping up over the next 5 years, we're going from a subjective basis to an objective basis. So as they build those bridges and those roads faster, we can do the same thing at the INEL. We're looking at incentives that will get us to our goals of cost and schedule sooner. We're looking at ways to cut our indirect costs. We're looking at ways to bring new missions, new work that are within our core competency within the INEL. All those different things, we're putting incentives on.

That's part of it, but really what is focused for this conference and how we think that the INEL is part of the solution is through the technology commercialization. First of all, like I said, we've got a lot of nifty technology, and we think there is commercial application. Lockheed has already demonstrated that in a couple of instances. So what we asked Lockheed to do was to come in and take the best practices from the private sector and look at these technologies and see if we can get these out to the commercial marketplace. But again, we're not so interested in process. How you do process is up to you. Before, we were kind of into just counting the number of processes, the number of contracts. That's nice, but we want outcomes. We want products out there. And what's a measure of products? It's a measure of the royalties coming in. It's a measure of the number of companies spinning off and the equity going out of these new companies. It's the products going out that people want to buy and people can use.

So again, what we said was, "All right, Lockheed, let's be really innovative. Let's do something different. Now part of this is that we want to take your traditional fee base, okay?"

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And they said, "We will put up 8 million dollars of fee over the next 5 years." In other words, 8 million dollars in the next 5 years that they would have won, that they would've gotten, they're not going to get. We're going to take it back. That's gutsy. That's really standing up where it counts. But it wasn't quid pro quo; in other words, if they could spin out technologies, they get to share in it. It's a real win/win situation. What we offer in return between 0 and 1 million, the contractor receives 20% of the royalty income. As the return goes higher, obviously it gets harder, so it's only fair that the contractor gets a share in a little bit more.

Also, as businesses spin out, we share in the equity, and it's not subject to any kind of regulatory limitations. And again it's a win/win. It's win for the taxpayers. It's a win for the INEL. And it's a win for Lockheed. Let's say that there is a 2.5% average royalty, and let's say they spin off products, about 15 million dollars worth. Now you need to know that right now, Oak Ridge, Tennessee, has won the best records in this today, and throughout the whole system, I think they've only got a million dollars in the past couple of years. But we're talking 15 million dollars just at the INEL. Now what's that going to translate in to? That means there would be whatever these technologies are, that's 600 million dollars of product sales. That's tremendous.

But what does that mean also to you? That means 4,000 years of primary employment. That's not secondary employment from all those people getting jobs, and those are good jobs that will be a result of those. That means that what those people are doing, they're working, they're paying their income taxes. Now through the law, we get to share in some of this. We're going to get 9 million dollars at the INEL that we can plow back into our R&D program, so we'll be kind of self-sustaining a bit through this program. And then the contractor shares, too. But remember, to break even over the next 5 years, the contractor's got to do better than 15 million because, remember I told you, it was 8 million that it put on the table. But Lockheed feels that they can do it, and they put their fee up on the line. So we are excited about this. This is gutsy.

But part of it is incumbent upon the feds, and so we had the secretary come out, and she announced a pilot program where we can get away from a lot of the red tape, a lot of the bureaucracy, and to do business like business does business. Again, we want to have different rules where we can have speed and flexibility because technology in the world is not waiting for the bureaucratic red tape. And so we're moving a lot the other way.

We're involving industry, universities, and we're learning to do it better. We're making this up as we go along, and this is an exciting place at the INEL right now because we really think that we are unique within the DOE system. We have, we feel, a real treasure within the state of Idaho here. We are the bridge between the basic research, the universities, and the government research labs and private industry. And we think we've got the model in place. We've got the incentive in place. We're got the right contractor here to make this work. And this is an exciting future for the INEL. We're going through some change now. We're getting more cost effective, and transition is hard. But in the long run, we are going to be a great institution. Thank you.

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Elizabeth Zinser, President, University of Idaho

I am going to speak for higher education in whole in Idaho as much as I can but I will use some illustrations more from the institution that I know best, the University of Idaho. I very much appreciate the opportunity to be here and also celebrate what the White House is doing in having these workshops and seminars across the country because it's an extremely important aspect of preparing ourselves not only for the present but certainly for the 21st century. And I also want to begin by briefly reviewing my viewpoint about some of the major areas we're dealing with and then talk a little bit about what I see developing in higher education that is beginning to show more and more promise for solutions for public/private partnership in this area.

But first, as far as barriers are concerned, barriers to the implementation of more sustainable systems and natural resource-based industries and also barriers with respect to creating and having a society characterized by sustainable human development, we have a number of things that we're having to concentrate on all at once: the barriers of economics, the barriers of technology, the barriers of population growth. Not just population growth, but the asymmetrical aspects of population growth around the world where the earth's carrying capacity is being threatened with the doubling in population every 20 years in some parts of the world, while having a doubling of the size of the economy every couple of decades in other parts of the world. Another barrier is poverty, which flows out of that phenomenon to some degree, and then the notion of people and their different viewpoints about the use and preservation of natural resources. And that all flows into the need for knowledge, but not just knowledge from an information point of view, but knowledge and insight that comes from exploring values.

So I want to talk a little more about education, and it's really the role, the importance of education as a whole in managing our human affairs to achieve sustainable human development in light of the exponential and the asymmetric demographic and economic changes that we're experiencing in this world. This requires, again, knowledge and the exploration of values. And I believe that it not only is important to pursue educational projects and programs at the grassroots level but do so with students gaining a better and better understanding of their relationship to the natural environment, their harmony with the natural environment, their harmony with the rest of the world from a global perspective, and their harmony not only with their ancestors, which is important and a part of our cultures, but increasingly a sense of harmony with those who are going to follow them, and providing for a real concern and care about those who follow them. And I think one of the aspects of education I always feel is important to know is that as we provide more and more opportunities for our students to get to know people of many, many cultures and nations, it's one of the most important values behind that in this subject that we're discussing today: there are so many different ways of thinking about the natural world around us that come from different cultures that we're not going to change our way of thinking very well unless we open up our minds and our hearts to the ways of thinking that come from other cultures, and so I want to make particular note of that as an important theme in our discussions.

Let me then move to some examples, just to relate some examples of work that's going on in our university and in its relationship to other universities in this state. You've been speaking a great deal already about water and our Water Resources Research Institute; Dr. Roy Mink is here, and I'm very glad to see him here. The Water Resources Research Institute is a very, very important part of our university and of our state, and it interrelates very well with other

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institutions. Let me just give you an example or two of their work and how they work in interdisciplinary teams engaging faculty and students from across the university. They work closely with business and with government in their activities. This institute works with our aquaculture institute; they're doing some work on the cost-effective ways to treat aquaculture waste, to identify source contamination in the mid-Snake River, and to address endangered species issues. Another example is that they work closely with an institute concerned with molecular biology, and in that environment, they are creating a new process for using immobilized microorganisms to degrade hazardous materials in soil and groundwater. Another is that this institute on water is working closely with another institute on materials science: that being to develop technologies for maintaining a viable mineral processing industry without contaminating our treasured water supplies. Now these are just three examples but, not only because the subject matter is important in and of itself, but because it demonstrates partnership relationships and the importance of interdisciplinary work in this area.

The infrastructure that is required to carry out the work of an institute like this, just using it as an example, involves many aspects. It involves research, support. It involves opportunities for students to learn in the laboratory of the research that's going on. It involves studies that can end up with the university, with the state, and federal agencies. It involves educating the public. It involves disseminating new knowledge and innovations to those businesses and agencies that can best put them to use. And therefore, the bottom line is, it represents public/private partnerships. All aspects of this work, I might add, as an educational institution provide tremendous opportunities for students to learn by thinking differently about the way we educate students and moving beyond just thinking about educating students in lecture halls and in the traditional way. But the investigations associated with this institute, the public education programs that work with the K/12 schools and teachers in the partnerships with business, all provide rich laboratories for learning for the students in a whole variety of fields.

Now I want to illustrate, and again using this same institute, how the University of Idaho works closely with our sister institutions, Idaho State University and Boise State University. Each one of these institutions has some very special strengths, and the whole purpose of this is try to trade up on the strengths of each of the institutions because they're very different. Boise State University, for example, has some tremendous strength in characterizing contaminants in soil and groundwater and also in their water supply research activities. And so through this institute, the U of I and BSU are working on a variety of projects, one being the future of the Boise water system as well as a project that involves also the city of Boise on the expansion of the existing geothermal heating system. With Idaho State University, some other examples apply. They have great strength in habitat assessment and biodiversity and endangered species work. So this institute is drawing together university people from both institutions to assess winter water flow effects on the survival of juvenile rainbow trout, again, just to give an example.

Now also through the University of Idaho and the state as a whole, we have a variety of other activities underway that I think are pertinent to briefly mention. We have the Idaho Geological Survey, which is now in its 75th year, and among the many things that it does, this past year it worked on characterizing environmental and physical hazards at abandoned mine sites. It monitored two major landslides and earthquake activities. It studied groundwater contamination in southeastern Idaho in connection with some of these other institutes.

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Another activity altogether is the forest utilization research center. This has been in place for 20 years and it does research and education to improve the forest management practices and to increase the productivity of Idaho's forests. Examples of what this particular organization provides is forest nursery, which educates students in nursery management and reforestation. It researches ways to propagate genetically superior commercial trees of high value. It has an experimental forest in which students and members of the public and others work in the context of workshops and research projects on forest management. And it involves a policy analysis group which is useful to Idaho's forest and wildlife managers and private land owners with respect to forest health issues and proposals for roadless and wilderness areas.

I can't help but mention because I'm not sure that wilderness has been discussed a lot at this conference, but it's something very close to my heart, and we do have a very special attribute here in the state of Idaho called the Taylor Ranch, which is truly a pristine wilderness environment in the Frank Church Wilderness. The university has the great pleasure of being the steward of that property, and it provides an opportunity for small groups of students and faculty to come and do some very special work on wildlife and on the habitat of wildlife.

There is such a thing that many of you probably know a lot about, and that is gap analysis. In our university, we're using gap analysis in the fish and wildlife area to seek to identify sensitive species and habitat so that solutions can be found before reaching the extreme conditions of being threatened or endangered. These are just some examples of the kind of research and education opportunities for students and faculty that go on at the university.

I would say that one of the most important points being made that I'm trying to make here is that it's important for the research of the university environment and the academic environment to be objective and to be credible, to continue to hold up strong standards so that the public, businesses, and the government agencies can continue to have a great deal of confidence in the environment of the university for such work. More and more, we're seeing collaboration in the public/private environment with industry, government, and university cooperation. Many examples of that could be cited but some of them have to do with the technology transfer and dissemination of the information that sometimes helps out in an established company like the Simplot company. Some of our faculty here at the university and at ISU are working together on bioremediation, having to do with chemicals from the agribusiness associated with the Simplot company down in Pocatello. And they are thrilled with that work and gaining a great deal of advantage not only in dealing with some issues that the company has but also participating in the invention of some new technologies that have to do with the use of microorganisms in bioremediation.

Another point about this too is that it provides incentives; we've heard a lot about the importance of incentives. And our faculty increasingly are enjoying the opportunity to develop new companies and work with their colleagues in business to establish new companies. And we have seen some develop with our faculty, one being an outgrowth of some new technology to grade dyes. There are dyes that are not harmful to the environment. Also, there are a couple of companies that relate to our biotechnology activities in terms of hazardous waste remediation.

One of the things that universities are really good for in this area is to provide a safe and objective environment to sort out conflicts about different points of view in this area. Our university established, not too long ago, a conflict resolution center, which was a joint venture

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between our Martin Institute for Peace and our ecology laws interest in conflict resolution. We now have a broader based organization and we're having some fun in doing some programming in conflict resolution, including areas like water. Last year, our Borah Symposium and our peace institute and our conflict resolution people got together and had the extraordinary opportunity on our campus for what was called a second level dialogue, bringing people that are just one step removed from the lead people that are negotiating on matters of water issues in the Mideast, and it was absolutely extraordinary to be the host campus of that type of an activity and have our faculty and our students have an opportunity to witness it, and some to participate in it.

Now there are so many aspects of the developments of the universities, the importance of what the universities and colleges do in this area, that it's really hard for me to try and just hone in on my remarks, but I am going to move to a couple of other examples. We have in our educational programs (moving away from research particularly) a number of educational changes taking place in our university, and I use this only to illustrate what I know is happening in many other universities as well, and also not to suggest that we're satisfied. There's lots more that needs to be done. But it's very pleasing to see our college of forestry and wildlife and range sciences just recently revise their curriculum to provide a much more integrated college core curriculum in this area so that all of the students in that college are receiving a much broader understanding of natural resources and sustainable development than they ever have before. This requires interdisciplinary teamwork on the part of the students and the faculty. It requires collaborative learning, all of which really improve the educational process. The curricula now in that college that are in the majors provide less emphasis on the traditional commodity production and much more emphasis on helping students have a greater understanding of the ecosystem. We have an undergraduate honors program at the university, and that college is making a contribution to it through a course or a seminar entitled World Resources and Sustainability. Other examples at the university that could be cited for student experiences is the fact that some of our students had a great experience participating with the Nez Perce tribe down in Lapwai in the early developments of the appaloosa horse business that was developing there. And I've heard wonderful stories about that experience.

Our students at the University of Idaho and our faculty are also very dedicated to the responsibilities they have for helping in partnerships with the schools, and so in terms of the K/12 environment, I would say that I'd like to mention a couple of examples. We have a project called the Project Learning Tree for forestry and ecology. We have a thing called Project Wild that helps teachers and young people learn more about wildlife. We have a Project Wet that's oriented to water resources, of course. We have a wood program that's called A Remarkable Fiber to help people understand more about raw material and its relationship to the environment. We have a group, through our water institute, that's called Stream Walk. It is all over the state for little children and their teachers to walk the streams and learn about the ecosystem and that environment. We have a summer Idaho science camp that's oriented to the environment for teachers and students to come on the campus, primarily students, and it's very oriented towards minority populations. And I'm proud that 35% of our students at the junior high school age that come to this program are Native Americans.

Now I could go on with other things having to do with continuing education and I won't do that, but I want to draw attention to the fact that environmental sciences programs are developing all throughout the country in our colleges and universities. When we put ours together, we had 67 undergraduate majors and 15 graduate students in the first 18 months. We already record

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about 800 requests for more information, so we're scrambling to try to deal with the extreme interest on the part of students today in this field. We're very, very pleased to have that challenge, and it is the most interdisciplinary undergraduate program and graduate program at our university. It literally involves nine colleges. I won't list them all, but you can probably imagine those that are involved: the natural resources colleges, the letters of science, our law college for water law and other issues, business education, all of them. And it's one of the most wonderful highlights on our campus, with the development and of all kinds of spinoff benefits from that collaboration as well.

Now I want to get close to closing here with one example of something that I think is rather unique and is taking place at our university. It's a good example of something that we should foster more, and it has to do with how we do business. The university, of course, is an educational environment, but it's also a business. We have things to take care of. We have buildings to repair. We have land issues. But normally, the way we handle these things is, if we've got a problem, we figure out a plan, we get the money, and we go out and contract to get something done. Well, in this case, the University of Idaho turned into itself and provided an opportunity to solve a very significant problem by using students and faculty and turning this problem into a learning laboratory. The whole area that's in the natural boundaries of the campus didn't belong to the university, which should be a part of the university in terms of our future campus development. Burlington Northern Railroad wanted to give it to us for a dollar, essentially. And we wanted that property. We need it very badly. But it was very contaminated. So, rather than going through the enormously expensive activity to hire work done externally and to get into a very complex set of relationships through all of the agencies and some nine or so businesses that were former tenants of this property that left petroleum contamination and agribusiness contaminations and so on behind, we turned this into a learning laboratory. And I can tell you that we were thrilled with the relationship that was established in this with the Department of Environmental Quality (DEQ) and also the EPA. They were willing to take a risk with us and to do something experimental. We had all of these former tenants with various businesses that had responsibilities for what they left behind, even though they hadn't been around for a while, and Burlington Northern standing by ready to give us the property. We weren't about to take ownership until it was clean, so we needed to get it cleaned up. So our students and our faculty got out there and engaged in some very sophisticated work. They have learned a great deal. They developed some new innovations as a consequence of it. The land has been cleaned up and understood well, and we just recently took ownership of that property. So it's a good example of where we can think about ways of doing business differently, and more effectively creating synergy between our student learning, our faculty research, and solving problems that have to do with just the basic infrastructure of the institution.

Now I'd like to point out before I close how important the relationship is for our colleges and universities to the INEL environment, and I was thrilled to hear the comments of Delores about their approach, and I want to echo that because we have seen evidence of all of that, and you have challenged us to think differently, to do things differently in our university environments as well. So we're very excited about our new forming relationship with DOE and Lockheed and this new partnership out there in Idaho Falls. And I'm pleased that the University of Idaho has a great deal to contribute to it as well as to learn from it. We work, as you might imagine, very closely with Washington State University; we're right up there in the Palouse, within 8 miles away, and we work very closely together in many areas, so that naturally draws us to the PNL laboratories as well as to the INEL. Our forte, of course, is our relationship with the INEL.

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Washington State works more with PNL, but there's a nice foursome there that can raise some very interesting opportunities for our two major laboratories, with our special focus, of course, on Idaho.

I'm going to close, then, with two suggestions. As I read nationally and think about how education is changing and must be changing in very profound ways today, there is a report that I would suggest to you. It's a Wingspread group on higher education; it produced a report called the American Imperative. It is about higher expectations of higher education. And we in higher education are welcoming those higher expectations. There are three main themes in that report. One, taking values seriously, such as helping students think about and being genuinely concerned for the rest of their lives about those who will come after them. Second, putting students first. And this augers well for programs such as the environmental sciences program. It augers well for programs like the campus compact program that's just spreading across the nation to support service learning on the part of students. And what a wonderful area of concentration for service learning for students. And the third has to do with creating a nation of learners. That is, life-long learning, and maybe building on ways to maintain relationships with our alumni by having a long-term contractual relationship with some of our alumni that would like that; also, keeping our faculty and our alumni in close touch over long periods of time to continue our process in creating a nation of learners.

And finally, another report that I think is very compelling is that of Tom Malone who has probably been quoted and cited in this group already in the last day. He talks about the global knowledge strategy. And I would submit then, in closing, that our most important responsibilities in the colleges and universities of this state and nation are to work to take values seriously in our educational programs, to put students first, and to create a nation of learners, and to do so in a manner that not only provides for innovation and incentive and excitement at the grassroots level in our educational program, but ties everything we're doing into a global knowledge strategy. Thank you very much.

6. Other General Session Speakers

This section of the report contains some of the addresses given during various general sessions of the workshop. (Other addresses given during general sessions, referred to as keynote addresses, are contained in Section 3.) These addresses provide information of general interest, presented by speakers representing a wide range of interests, including industry/public councils, government/public councils, and conservation.

Joy Myers, Citizens Advisory Board

In order to place my remarks in the proper context, I'm going to ask you to think of the public in a little bit broader terms than public/private partnerships, which are referred to largely as public institutions. When I speak of public, I'm talking about the general public or stakeholders, without whose buy-in, even the best decisions will probably be doomed. You as business people and government representatives well know what happens if you resort to the old model of decide/announce/defend. Opposition results and you end up spending more time trying to sell your decision then getting on with the work at hand. The realization of public buy-in is essential; this led to the development of a large growth industry: that of public involvement. Make no mistake, public involvement is not a drill. It has become essential to success. As with any new approach, public involvement has gone through a process of evolution. We're probably still going through it. Public hearings, written testimony; you think of it as polling, marketing profiles, coalition building, faxes, and e-mail; even that 15-second sound bite on the evening news that can be devastating. Many techniques have been tried, some with more success than others. And probably all could benefit from the public involvement process, but they all have drawbacks. The most serious is that, frequently, these attempts at public involvement come so late in the decision-making process that the public feels that they really had no input or that their comments weren't heard or answered. In short, the public is forced into a reactive position. And you as recipients of that advice have an additional problem. How do you interpret this input? Is it representative of the public at large or of merely a large or small vocal segment? Is it representative of the public that are truly stakeholders in your decision? And in this information age, are you hearing from the electronically challenged? The group I represent is the Environmental Management Site-Specific Advisory Board for the INEL. It's a citizen's advisory board in spite of the rather complex name. It's one possible solution to the question of getting public input. If nothing else, it provides the opportunity to get thoughtful, informed input, which is not only proactive, but when the board is properly formed, will give you a broad stakeholder perspective into your decisions. It holds the potential promise of being more representative of the broader public than the shotgun approach.

Let me tell you a little bit about the Site-Specific Advisory Board at the INEL and maybe some things will become a little clearer. The formation of the group was a joint initiative of DOE and various citizens of the state who wished to have a larger voice in the decisions relevant to the INEL. An outside neutral facilitator was hired, and a core group of 25 individuals who had demonstrated interest in the site acted as a design committee. The INEL was supportive but it didn't intervene in the design process. The most important task of the design committee, in my opinion, was to define the composition of the board. They decided that the advisory board should represent the entire state and that the size of the board should be limited to a workable 15. They determined that the advisory board would not be a coalition of organizations but would be composed of individual stakeholders, representing identified stakeholder perspectives. No one was asked their existing opinion on the INEL. They went through a lengthy process of identifying

6. Other General Session Speakers

the stakeholders and came up with a list that includes the Shoshone-Bannock tribes, site-related union and work force, affected local governments, environmental interests, business interests, natural resource users, education, health professionals, and the general public. Seven members of this design committee then went on to a selection committee and advertised for members across the state. Over 550 applications were mailed out and over 150 were returned. Using a complicated matrix, the 15 current members were chosen. The board is widely diverse, and in addition to representing all areas of the state and broad stakeholder perspectives, also represents a wide range of attitudes toward the INEL. This brochure identifies our members and the constituencies that they represent. It also includes a statement of board values, which is another important factor. It was at this point that our advisory board became a part of the complex-wide Site-Specific Advisory Board, which is chartered under the Federal Advisory Committee Act. Similar advisory boards exist at Hanford, Rocky Flats, Nevada Test Site, Pinellas, and Savannah River. The sites are representative of DOE Idaho. EPA Region 10 and the State of Idaho have ex officio representation on our board, and recommendations can go to anyone or all three agencies.

In our operation, we choose our own issues to study and spend many hours studying them in-depth, both individually and as a group, before attempting to reach agreement on a recommendation, and I think this is most important. Our recommendations are based on factual information, and I think that's one of the things that both business and government needs. We work through an independent neutral facilitator and staff, and I also feel that this is essential. It gives us a step between ourselves and the INEL. All decisions are made by a consensus process. If the recommendation isn't one with which the entire group is comfortable, a majority/minority report is issued.

I'd like to digress for a moment. Delores Ferri, this morning, spoke of outcomes or products. I feel this is most important because, as I view it, the board is not going to be worth the time that's committed to it if we don't do some problem solving and come up with a recommendation. In other words, have a product. A recommendation that identifies the level of support and the level of opposition has some useful value to DOE because it gives them an idea of how the general public will feel based on our stakeholder group. So far, since becoming fully operational early last fall, we submitted two recommendations. Both were quite detailed and dealt with broad policy issues. That's another thing that the board attempts to do. We don't attempt to micromanage. We'll come up with a broad policy decision. As Secretary Grumbley said, we can say that we need a bridge, but we don't need to specify the size of the bolts.

The board invites public comment and involvement in selecting our priorities, and invites the public for their input during our decision-making process. We try to inform the public of our activities and decisions after they're made. I'd be remiss if I didn't point out that DOE has been really good in their support of the board. They've been cooperative with our requests for information, and those have been considerable. They've not attempted to lead or sway the board during our deliberations, and they've been receptive and responsive to our advice. It hasn't been easy. In fact, Elizabeth Zinser mentioned this morning a conflict resolution work that's going on at the University of Idaho through the Martin Institute for Peace. One of our members is a member of that group, and we had some conflict resolution training at one of our earlier meetings. And it has been valuable. I've also been impressed with the seriousness with which the board approaches its tasks. It's also interesting how much more useful and sound group advice really is, based on study and the decision and the discussion. But most of all, I've been impressed

with how the sharing of stakeholder perspectives in such a forum draws on that which we have in common rather than which divides us. Best of all, the board has the satisfaction of knowing that we're proactive, not reactive. I'm not suggesting that you let the public make your decisions or that you even let the public try to drive your decisions. What I am suggesting is that you make an attempt to involve your stakeholders early enough in the process that their input has value to you and has some value to them. Collaborative decisions generally are better decisions, but best of all, they don't have to be sold to an unwilling public. I found it interesting that six of yesterday's speakers and three of them this morning all mentioned the importance of public involvement. If you can bring your stakeholders along with you right from the start, if you can make the public feel that they are participants in your decisions, whatever your decisions are, if you can get the public's buy-in, I think all will benefit. In the old system of decide/announce/defend, decide and announce are really easy. It's defend where you really start having your problem. Decide/announce/defend simply hasn't worked, so maybe it's time to try something new. We're in the early stages of working with this particular answer to public involvement. So far, I think it shows some real promise. Maybe in about a year we'll let you know how it really turns out. Thanks.

Karl Brooks, Executive Director, Idaho Conservation League

The whole question of how to develop a sustainable economic future is one in which I have a lot of interest as an Idaho native and as a conservationist. Let me begin with an introduction. The Idaho Conservation League is a 23-year-old citizens environmental organization. We have a state office here in Boise and field offices in northern Idaho and central Idaho. For the last several years, the League has invested considerable effort in promoting the concept of sustainability, focusing on three major objectives:

- Trying to encourage citizens and taxpayers to become involved in public decision making that affects Idaho's environment. In that capacity we have a lobbyist working to promote environmental interests at the state legislature.
- Making sure that policymakers consider the long-term consequences of their decisions as they affect the scarce natural resources, the extraordinary scenery, and the quality of life here in Idaho.
- Serving as a catalyst for incorporating sustainable economic principles in business and government.

As we undertake to promote these concepts of sustainability, one of the biggest obstacles we face is a public relations problem. In the recent past I have had three experiences that illustrate and underscore this problem.

Not long ago, the Idaho Conservation League published an editorial piece in the newspaper in Sandpoint, Idaho. The newspaper also published several letters to the editor that people wrote in response to the editorial. One of those letters stated that sustainability is just a code word for an effort by big-city elitists to shut down the wood products industry in small towns in northern Idaho. This gives you an idea how volatile the issue can be.

6. Other General Session Speakers

About a year ago I was invited to speak in Twin Falls, Idaho, at a conference on sustainable development sponsored by the State of Idaho. Before I went to speak there, I talked with my father-in-law, who is a cattle rancher in eastern Kansas, a fourth generation cattleman. He said, "I know what sustainability is, that's when people who live in cities come out to the country and tell us how to farm and ranch." I thought about that for a while.

I had a similar experience at a conference here in Boise in May on sustainability, sponsored in large part by the State of Idaho. I was in a breakout group with a fellow who is a vegetable farmer in the southwestern part of the state. He said, "I don't think it serves much purpose for the Farm Bureau to be involved in discussions about sustainability as long as most of the members believe that sustainability is really nothing more than camouflage for an effort to eliminate chemistry technology from farming."

These comments pose one of the biggest challenges that you, your stakeholders, your investors, and your friends and neighbors have to wrestle with when you talk about how to develop a more sustainable economy or what type of partnerships work. There is a tremendous amount of unease and, frankly, fear and denial in this part of the world about what sustainability means.

Gatherings like this are good because they bring light on the subject, and they can replace fear and denial with hope and commitment. However, I do not want to sugar-coat for you the amount of uncertainty that's out there in the community about what the sustainable future means for the State of Idaho. This uncertainty makes your challenges and my challenges a little bit more difficult but also a little bit more important.

This effort is important because a place like Idaho is tailor made for sustainable thinking. Without much effort at all I came up with six factors that should make this part of the world a test ground for sustainable thinking.

First, Idaho has the one of the most enjoyable, desirable qualities of life in North America. We have a great thing going here, and I think that all of you, whether you are natives or newcomers, know that. So we have a lot to defend, we have a lot at stake here.

Second, decisionmaking in this state is very accessible. I don't care if you are talking about the legislature, or the city council, or an advisory board. For the most part, decisionmakers are close to the citizens and the taxpayers. We are still a pretty neighborly place. I do not know of a single legislator whose telephone number isn't published in the telephone book. I believe the same is true of city councilors and other public servants. This means that the interchange of information and knowledge is very easy here; there are not a lot of barriers to communicating.

Third, we have a small population that is still relatively homogeneous. It should be easier to agree on basic common principles in a place like Idaho than in more complicated places like California or Illinois where there are large populations to deal with and frankly, a lot of divisions within those states.

Fourth, we have one of the highest percentages of business entrepreneurs in America. This is the place where people think about doing things in new ways and then take those ideas out of the workshop and out of the laboratories and make them happen.

6. Other General Session Speakers

Fifth, we have a strong historic tradition of cooperative economics geared toward the long term. This, coupled with this strong strain of entrepreneurship, has produced some great examples of collective community economic activity in this state's short 125 year history. Water development in southern Idaho, and all up and down the Snake River, wouldn't have happened without the very strong degree of commitment to common goals and the ability to work together in public/private structures. Another good example is grazing. Since the Taylor Act passed in the 1930s the disposition of management of the range lands in Idaho has largely been a matter of neighbors sitting down with neighbors and working out the best long-term future for those grazing lands. At a time when the condition of the range lands were disastrous, we were able to pull together as neighbors in the early 30s and build public/private partnerships to put grazing here on a long-term sustainable basis. (This is not to suggest that there is no room for improvement.)

Finally, as a native of Boise looking east across the state, I see a willingness to work together among the residents of Eastern Idaho because of the Mormon heritage there. People pull together as neighbors working toward common goals. This historic strength should help Idaho be real leader in sustainable economic thinking.

Last October an interesting item was reported in the press. Each year the Institute for Southern Studies, from Durham, North Carolina, publishes what they call a green and gold index. They look at states in the U.S. and rank them according to whether they have really good, progressive, strong environmental protections, and then they rank them again according to how prosperous they are. It turns out that these qualities correlate very closely, so that a place like Idaho, which does a pretty good job of taking care of its resources, scores very high on this green and gold index. So do our neighbors in Oregon, Washington, and Utah. States at the top of this green and gold index, states like Oregon, Washington, Idaho, Minnesota, and Wisconsin, tend to be both prosperous and environmentally conscious. These are very desirable places to live. When you look at some of the states at the bottom of the index, places like Mississippi, Louisiana, and Arkansas, it's easy to see that what we have going here in the Northwest is definitely the right track. I think it validates those who say that you cannot have true long-lasting economic prosperity without making sure that you have a healthy environment and a healthy natural resource economy.

From the perspective of the Idaho Conservation League, we are really encouraged by gatherings like this one; we favor such gatherings. We try to be a catalyst at the local level in thinking about sustainability. I don't want to underestimate to you how much distance we still have to travel to make this concept of sustainable thinking something that comes out of the cloud or out of Rio de Janeiro or out of the White House Office of Science and Technology and have it mean something to the people in communities like Castle or Kender Idaho. There is still a long way to travel, and frankly we are happy to help you travel along that way, since we are headed that way ourselves.

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Jim Yost, Idaho Council on Industry and Environment

In representing the Idaho Council on Industry and Environment, I have to give this disclaimer. Generally, most of what I am going to say is really the true feelings of the Idaho Council on Industry and Environment. Every once in a while when I am giving a presentation, I put in some of my own thoughts. Please don't hold those against the ICIE.

Lamar Alexander, a former Secretary of the U.S. Department of Education, said that "when politicians have their ears to the ground, that position puts their rear ends in an undignified position," and ICIE believes that those decision makers today must assume a position that is a little more dignified. Perhaps a balanced position is the position that we should try to achieve. Since its inception, the Idaho Council on Industry and Environment has put forward the concept that science should be the driving force in much of the decisionmaking in some of the natural resource issues and problems in the environmental situations we face today. We feel that science then should be the tool that we use to make some of those fundamental decisions. It's o.k. to have political decisionmaking, it's o.k. to have emotional decisionmaking, but what we would really like is a little more science to enter into those decisions.

ICIE was formed about six years ago, and it's accomplished a lot in presenting science and balance into some of the environmental and natural resources discussions that have taken place in the last six years. We have presented or helped present over 200 seminars in that time, many such as this. We have also presented over 200 speaking engagements in last three years to help to bring a point of view that in many of the issues we are trying to decide today, a little more information and a little more science would perhaps aid that process. ICIE's members compose companies, associations, and industry, and are of all types and political persuasions. I think that one of the assets of the ICIE in making this commitment to these environmental projects and discussion is that we pool a lot of talent from our membership and from the community in Idaho. With that talent pool to draw from, we are able to establish a very good information network. We find out the particular talents that are available on a particular issue, and have them make presentations to the public to increase their knowledge and to those folks who are going to make management decisions. We present that information in quarterly newspapers and distribute about 6200 newsletters on a quarterly basis.

One of the major components of the ICIE that I think is extremely beneficial everyone in Idaho that is faced with helping resolve some of our problems is our focus on Education and encouraging science in educational programs. We encourage and support the Idaho Education Alliance for Science; that is an umbrella organization that promotes math and science in Idaho schools.

We also support the Chemical Education Public Understanding Program (CEPUP). CEPUP is a hands-on type program designed for seventh- and eighth-grade students in Idaho schools. It teaches them how to make things and what a part per million is. CEPUP is an important program that supports Ag in the classroom, to help students get a better understanding of the relationship between agriculture and the environment.

We have also supported the Resource Environmental Awareness Project (REAP). The REAP program focuses on issues of natural systems, biodiversity, and the effect of exotic species on Idaho's ecosystem. That program was developed by the ICIE about two years ago, and just in

6. Other General Session Speakers

the last year has finally gotten into some of the school systems. These are just some pilot projects, but it looks very encouraging at this time.

In addition to the newsletter, ICIE presents an issue watch on the environmental news or natural resource news. We also do background on specific topics, on solid waste, water quality, the INEL, and agricultural pesticides. We do legislative updates every week when the legislature is in session, and we are an information clearinghouse and a library, with various videos and environmental information. We present some outstanding workshops on pollution prevention, endangered species, wetlands, global warming, and waste management. One of their highlights every year is to sponsor an Earth Day art contest with the Boise area students. That is gaining tremendous support in the Boise area, and hopefully we will extend that later to other areas of the State.

ICIE is an organization, with its membership increasing, that promotes a focus on science and the use of science in decisionmaking, and presenting that information to policy makers and to general public as well. Those of us who will have a better understanding of the problems we are facing in Idaho today and we hope better decisions can come from that. I appreciate the opportunity to be here.

I want to say that I promised not to get too political today, but I'm going to have to divert from that for just a minute. There was a Congressman in Tennessee that was defeated in the election. He returned to Tennessee, and he was very saddened by that occurrence so he decided to address a group of his constituents and voters in the capital in Nashville. When he got there, he addressed those folks and he was a fairly straightforward politician and he said, "I want you all to know that I'm going to Texas and all you folks out there can go to hell." Well, I want you to know today that might have been a little undignified, and it might not have been a balanced position, but Davey Crockett was man a few words and knew where he was going and knew what he wanted to do. So in closing today, I want to tell you that ICIE is not going to Texas and I want all of you to know that ICIE wants you to attend the next focus group.

Appendix A Workshop Agenda

AGENDA

January 1, 1995

Sponsors and Speakers Breakfast - Convention Center, Salmon Room

Registration - Convention Center, Summit Room Foyer

General Session - Summit Room

Introductions - Susan Prestwich, Program Formulation Development Team, DOE-Idaho

Welcome - The Honorable Phil Batt, Governor, State of Idaho

Welcome - John Wilczynski, Manager Department of Energy, Idaho Operations Office

Film - "Technology for a Sustainable Future"

Conference Overview - Susan Prestwich and Bill Schutte, Director, Office of Demonstration, Testing, and Evaluation, U. S. Department of Energy

Industry and Technical Panels - Summit Room

Agriculture

Industry Panelist: Gregory A. Ledbetter, Owner, C Bar M Dairy

Technical Panelist: Paul Reep, Manager, Agriculture & Food Products Program, Lockheed Idaho Technologies Company (LITCO)/INEL

Water

Industry Panelist: Joan Cloonan, J. R. Simplot Company

Technical Panelist: Roy Mink, Director, University of Idaho Water Resources Research Institute

Mining

Industry Panelist: Jack Lyman, Executive Director, Idaho Mining Association

Technical Panelist: Mel Shupe, Manager, Western Environmental Technology Office, DOE

Break

Industry and Technical Panels, Summit Room

Forestry

Industry Panelist: Donald Smith, Vice President, Timberland Resources, Boise Cascade Corporation

Technical Panelist: William Apel, Principal Scientist, LITCO/INEL

Energy

Industry Panelist: Larry Crowley, Vice President, Strategic Planning, Idaho Power Company

Technical Panelist: William Thielbahr, Director, Program Formulation Development Division, DOE-Idaho

Environmental

Industry Panelist: Tom Haislip, Manager, Water Business Line, CH2M/Hill Company

Technical Panelist: Kathleen Hain, Principal Senior Scientist, DOE-Idaho

Working Lunch in Exhibit Area - The Falcon's Room

General Session, Summit Room

Introductions - Susan Prestwich, Program Formulation Development Team, DOE-Idaho

Speaker - Dr. Tom Houlihan, White House Office of Science and Technology Policy

Speaker - Susan Tierney, Assistant Secretary for Policy, U. S. Department of Energy

Speaker - James Hawkins, Director, Idaho Department of Commerce

2:00 **Focus Groups - Technologies for Sustainable Development** - The Glen Rooms (Cottonwood, Fir, Pine)

3:45 **Break**

4:00 **Focus Group Reports** - Summit Room

5:00 **Reception in Exhibits** - The Falcon's

6:30 **Closed for day**

February 2, 1995

7:00 **Speakers Breakfast** - Convention Center, Salmon Room

7:30 **Registration** - Summit Room Foyer

8:00 **General Session** - Summit Room

Introductions - Susan Prestwich, Program Formulation Development Team, DOE-Idaho

Welcome - Dr. Barton Krawetz, Vice President, Lockheed Idaho Technologies Company, Idaho National Engineering Laboratory

Speaker - Bill Schutte, Director, Office of Demonstration, Testing, and Evaluation, U. S. Department of Energy

8:50 **Panel on Infrastructure for Sustainable Development**, Summit Room

Ginger Swartz, Western Governor's Association

Thomas Ripke, Executive Vice-President, West One Bank

Marvin Osborne, ShoBan Tribal Chairman

Jeff Walker, Senior Specialist Assistant, Governor's Office

Dolores Ferri, Acting Deputy Manager, DOE-Idaho

Elisabeth A. Zinser, President, University of Idaho

10:00 **Break**

10:15 **Focus Groups on Infrastructure for Sustainable Development** - The Glen Rooms (Cottonwood, Fir Pine)

12:00 **Working Lunch and Focus Group Reports** - Summit Room and Summit Room Mezzanine

1:30 **General Session**, Summit Room

Introductions - Susan Prestwich, Program Formulation Development Team, DOE-Idaho

Speaker - Joy Myers, Citizens Advisory Board

Speaker - Karl Brooks, Executive Director, Idaho Conservation League

Speaker - Jim Yost, Idaho Council on Industry & Environment

2:00 **Reconvene Focus Groups, Conference Recommendations** - The Glen Rooms (Cottonwood, Fir, Pine)

3:30 **Break**

3:45 **Focus Groups Reports** - Summit Room

4:45 **General Session** - Summit Room

Wrap-up - Susan Prestwich, Program Formulation Development Team, DOE-Idaho

5:00 **Close**

FOCUS GROUPS

Agriculture - Ponderosa Pine A Room

Facilitator: Wade Hillebrant
Technical Resource: Gary Schneider, Program Formulation Development Team, DOE-Idaho
Reporter: Richard Hess, Plant Physiologist, LITCO/INEL

Water - Ponderosa Pine B Room

Facilitator: Elizabeth Bowhan
Technical Resource: Roy Mink, University of Idaho, Idaho Water Resources Research Institute, and Jim Mills, Manager, Energy & Resource Analysis Products, LITCO/INEL
Reporter: Larry Redd, Program Formulation Development Team, DOE-Idaho

Mining - Douglas Fir A Room

Facilitator: Dave Wessman
Technical Resource: Jim Wolfram, Scientific Specialist LITCO/INEL
Reporter: Bob Brown, Program Formulation Development Team, DOE-Idaho

Forestry - Douglas Fir B Room

Facilitator: Charles Mozzer
Technical Resource: Gregory White, Scientific Specialist LITCO/INEL
Reporter: Marilynne Manguba, Senior Operations Technician LITCO/INEL

Energy - Cottonwood A Room

Facilitator: Bob Blyth
Technical Resource: Shirley Sandoz, Director, Alternative Energy Projects, LITCO/INEL
Reporter: Eric Hoffmann, Program Formulation Development Team, DOE-Idaho

Environment - Cottonwood B Room

Facilitator: Carol Henning
Technical Resource: Kathleen Hain, DOE-Idaho
Reporter: John Robinson, Program Formulation Development Team, DOE

Press Room - Willows

Appendix B
Focus Group Charts with Ratings

Appendix B

Focus Group Charts with Ratings

This appendix contains charts generated by the water and environmental technology focus groups; each chart contains numbers, which indicate how important each participant considered the factor: 1 is low importance, 5 is high importance. Government, public, industry, regulators, academia were represented. The water focus group averaged the total of the participant's responses, while the environmental technology group retained their individual ratings.

Water Focus Group Charts

Table B-1. The importance of obstacles to sustainable use of water. The x's are placed next to the ones that averaged 4 or better in terms of priority.

Obstacle	F&W	Public	Industry	Regulators	X if rated ≥ 4
A/B Competing uses for water (more uses than availability)	4	5	5	5	X
C Controversy and no commitment to compromise	5	3	3	3	
D Existing processes not working	4	4	5	5	X
E Lack of information	-	4	3	3	
F Information gathering vs. need for action	4	4	4	3	
G Lack of communication	5	5	4	4	X
H Need mechanism for coordination of effort	5	4	5	4	X
I Past uses not compatible with future uses	3	4	4	5	
J "Use or lose" (existing water law)	3	5	5	4	X
K Greed—want most and best	4	3	3	4	
L No thought about waste water & water quality*					X
M Need for research on water resource	4	4	4	3	
N Cost of collecting information	-	3	3	3	

Table B-1. (continued).

O	Window of gathering: season, depth, technology, perspective	2	3	3	3	
P	Cost of treatment*					
Q	Lack of continuity in resource management	5	4	4	5	X
R	Political variability	5	4	4	4	X
S	Resistance to change in adopting new technologies	3	4	3	4	
T	Success criteria	4	3	3	3	
U	Conflict between conservation and supply	3	5	4	3	
V	Poor water quality	2	3	3	3	
W	Local cultures	5	5	5	5	X

Table B-2. Importance of tools to sustainable use of water.

Tools	F&W	Public	Industry	Regulatory	X if rated ≥ 4
Education	3	4	5	5	x
New communication forums	5	5	5	4	x
Incentives for participation	5	4	5	4	x
Reevaluate existing water law	4	4	4	5	x
Review administrative instructions for effectiveness	4	3	4	5	x
Develop information management tools and provide access	3	3	4	3	
Research directed toward specific problem solutions	5	4	5	3	x
Nonadversarial resolution system	3	5	4	5	x

Table B-3. Roles of economic sectors in encouraging sustainable development of water.

Govt	Roles				
	F&W	Public	Ind.	Univ	Reg
Information funding	3	4	4	4	3
Proactive regulations	5	5	5	5	5
Set goals	5	5	5	5	5
Research	4	2	3	2	3
Collaboration w/public and industry	5	4	4	3	3
Dynamic plan	5	5	5	5	5
Incentives	3	5	4	2	3
Rules/good information	3	5	5	5	4
Cumulative impact	5	5	5	4	5

Public	Roles				
	F&W	Public	Ind.	Reg	Univ
Info	4	4	4	3	4
Drive govt	5	5	4	5	4
Active involvement	5	5	5	5	5

Univ	Roles				
	F&W	Public	Bus/ind	Univ	Reg
Education	5	5	5	5	5
Research	5	5	5	5	5
Cooperation	5	5	5	5	5
Info transfer	5	5	5	5	5

Table B-3. (continued).

Business & Industry	Roles				
	Univ	F&W	Public	Ind	Reg
P. P.	5	5	5	5	5
Full \$ assess	5	5	5	5	5
Adapt mgmt	5	5	5	5	5
Problem focus	4	3	4	4	5

The Water focus group identified the following issues, which indicates the importance of the various types of infrastructure needed to support sustainable development (Table B-4).

Table B-4. Infrastructure concerns for water.

Infrastructure	F&W	Public	Ind.	Univ	Reg
Forums	5	5	5	5	5
Plan	4	4.5	5	4	5
Regulations	4	4	5	4	5
Flexible structure	5	5	5	5	5
Level playing field	5	5	5	5	5

Environmental Technology Focus Group Charts

The Environmental Technology Focus group identified obstacles to sustainable development (Table B-5) and tools that would aid development of environmental technologies (Table B-6). Table B-7 identifies roles of economic sectors in encouraging sustainable development. Table B-8 identifies environmental infrastructure concerns. All tables include the rankings of importance to the participants representing different sectors of society: Small business, public, Federal government, state government, and industry (large business).

Each participant rated each obstacle on the following list. The ratings were supposed to range from 0 = no significance, to 5 = critical significance. The ratings of 5+ and ? indicated, respectively, very strong opinions and confusion. The ratings are shown by economic sector. The number of ratings in each box of the sector/obstacle matrix indicates how many participants in the Environmental Technologies Focus Group rated that economic sector. Not all participants chose to rate the obstacles and not all raters had opinions about every obstacle. The order of ratings in each matrix box has no particular significance. Individuals had to take turns marking the sheets and did not mark them in order. The obstacles do appear in the order each was stated in the focus group session.

Table B-5. Importance of Obstacles to Application of Environmental Technologies.

Obstacles/Barriers	Small Business	Public Interest	Fed Gov	State Gov.	Industry
Government dictating solutions as opposed to identifying problem	3,3,3,5	5,4,3,3	4,4,4	4,5,5	4,4,4,4,5,4
Lack of technology to meet the mandates	3,3,2,2	3,2,1,4	4,3,2	3,5,1	4,3,5,1,3,2
Inadequate analytical capability (tech and economic)	4,3,3,2	3,3,2	3,2,2	4,2,4	3,3,3,5,5,2
Public doesn't see sustainability as a problem	3,2,3,2	5,4,0	4,3,2	3,0,5	3,4,4,3,5,5
Going through permit process more than once	2,3,2,2	3,3,3	3,3,4	4,5,1	4,4,4,3,3,4,4
Rules change	4,5,2,2	5,4,4	4,4,4	4,5,4	4,4,5,4,4,3
Result doesn't meet the design specifications	4,3,3,2	2,3,4	4,4,4	4,4,5	4,4,5,2,3,3
Too much regulatory red tape	5,5,4,3	4,5,5	5,5,4	5,5,1	4,4,4,4,4,4
(No Trust) Federal Govt putting itself on a different level than the public	3,3,1	5,4,4	4,5,2	4,4,1	4,3,4,5,3,4
Legal system can compromise the system	2,3,1	5,5,3	3,5,4	5,1,3	5,4,5,5,5,4
Lack of public trust	3,2,4,3	5,5,5,5	5,5,4	3,5,5	5,2,2,5,3,3
Lack of clear conveyance of needs to the outside	3,3,4,5	3,3,4	3,4,2	2,5,4	2,2,3,3,3,4

Table 1B. (continued).

Obstacles/Barriers	Small Business	Public Interest	Fed Gov	State Gov.	Industry
Laws and Regulations	4,3,4,2	5,5,4	5,5,3	4,5,5	5,4,5,5,5,
Understanding Comparative risk	5,4,3,2	3,5,5,5	5,5,4	5,1,5+	4,3,3,5,4,5
Partnering between regulators and the regulated	4,2,3,5	4,3,3	5,5,3	4,5,5	2,4,4,3,1,4
How clean is clean	5,5,5,5	4,5,5,5	5,5,4	5,5,5	4,2,5,5,2,5
Policies are formulated by special interest group, may not represent the public	4,3,4,3	5,5,4,3	3,3,2	4,4,1	3,3,3,3,5,5
Without laws, sustainable development is not possible	4,5,5,5	3,4,2,5	2,2,4	4,3,5	3,4,3,2,4,4
Not enough incentive for sustainable technologies	4,5,5,5	5,3,5,5	5,5,5,2	5	5,5,5,5,5,5
Save one resource at the detriment of another resource	1,2,2,2,	3,4,?	3,5,5	1	3,1,2,2,3,4
Lack of comprehensive strategic planning between government agencies	1,4,4,4	4,5,4,5	4,5,5	4,1	2,5,3,4,0,3
Effective management of public participation	1,2,4,4,	4,5,5,4	4,5,3	5,1	3,3,3,4,2,2
Lack of system for communications at appropriate levels	4,4,2,3	3,5,5,5	5,5,4	5,5	3,2,3,2,1,3
Different agencies at cross purposes	3,3,2,2	4,3,5,3	3,3,4	5,5,3	4,3,3,5,3,5
Different agencies with different purposes	3,2,3,2	5,3,5,3	3,3,4	5,5,3	4,3,4,5,4,5
Public perception usually holds priority	4,5,4,2	3,3,3	4,4,4	4,5,1	3,3,3,3,3,5
Unfunded mandates lead to crisis management	2,2,1,2	5,5,3	3,4,4	5,1	1,2,3,5,4,5
Lack of available financing	5,4,5,5	5,5,5,5	2,3,4	5,5,5	5,5,2,2,1,4
Getting permits to demonstrate new technologies	4,5,5,4	2,3,3	3,3,1	4,5,5	4,5,2,1,3,3
Liability	5,3,5,4	4,3,5,4	4,4,4	5,5,3	5,4,5,5,5,3
"Not in my backyard" syndrome	2,3,2,3	3,4,5,5	5,5,4	4,4,1	3,3,3,4,4,5

As with question 1, the focus group next developed a list of tools they felt are needed to support sustainable development. The tools were rated in the same manner as the obstacles were rated for question 1. The final list is shown in Table B-6.

Table B-6. Importance of Tools Identified As Needed for Sustainability.

Tools	Small Business	Public Interest	Fed Govt	State Govt	Industry
Communication and coordination network	5,5,1	3,5,5	4,4,1	5,5	4,3,1,2,3,3
Uniformity in processes (risk assessment & permitting)	3,4,4	4,5	4,4	5,3	3,3,4,3,4,4
Education as part of strategic planning	3,4,4	4,5,5	4,3,2	3	3,4,3,3,4,4
Rapid funding for implementing new technologies	5,5,2	4,5	4,2	5,5	5,3,4,4,1,3
Inclusion of "soft stuff" in permitting	3,3,3	2,5,5	3,3	5	2,3,5,4,4,3
Multi-state permitting	2,2,3	3,5	3,1	5,2	4,4,3,5,2,5,4
Tools that allow for multi-variable things—global perspective	1,5,5	3,5	3,3	5,2	3,3,5,4,5,5
National mandate on sustainability	2,1,5	1,5	5,3,4	5	4,3,4,1,1,3
Expand college curriculum on environmental	1,5,3	3,4,4	3,3	1	3,3,2,2,1,3
Comprehensive wetland strategies	1,5,3	2,3	3,4	4,2	2,2,3,2,4,3
Global markets database	1,4,5	2,5	3,2	5,5	4,3,3,2,2,3
Review of regulations for risk prioritization	1,4,4	5,5	4,4	5,3	3,2,4,5,5,5
Incentives	2,5,5	5	5,1	5,5	5,2,4,5,1,4
Life-cycle & economic analysis for tradeoffs	3,3,4	4,5	4,4	5,5,4	4,3,5,5,5,5
Tie enforcement to specific percentage of the GNP	2,3,1	5,5	3,1	0	1,1,5,3,3,3
Global view of the whole system	1,3,3	3,5	3,4	1,5	3,2,5,5,3,3
Valuing natural resources in economic models	5,4	4,5	4,4	5,5	5,3,2,4,4,4
Alternative technology incubators	5,4	5,5	5,1	4,5	4,2,5,2,2,3
Put it on Internet	5,4	3,4	4,4	4,3	1,2,4,1,2,3
Evaluate model that takes in social/economic data	4,4	4,5,5	3,4	5	4,1,3,3,2,4

Table B-7. Roles of Economic Sectors in Encouraging Sustainable Development.

Federal Government Roles	Small Business	Public Interest	Fed Govt	State Govt	Industry
Set broad goals, provide less "how to"	4,5	5,5	5,5,5	5	5,5,5
Continue funding entrepreneurial activities that result in new environmental technologies	5,1	4,4	4,4,3	5	3,2,5
Provide incentives/standards	5,3	5,3	4,4,4	5	4,5,5
Be cost conscious of how \$ are used	4,2	5,5	4,5,4	5	4,3,5
Regulatory driver (risk & cost based)	4,1	5,5,	5,5,5	4	4,2,5
Risk communicated to public	3,1	5,5,	5,5,4	4	4,4,5
Put regulations in place to promote avoidance	3,3	5,5,	4,5	4	3,4,5
Lead by example	5	5,5,	5,4	5	5,5,5
Retrieve information for general dissemination	4,4	5,3	3,4	4	3,2,4
Value national resources in national economic models	2,1	5,2	5,4	4	3,5,5
Criminal and civil penalties	3,4	5,5	4,4	3	2,2,3
Market-driven technology & research	1,3	4,5	4,1	4	5,5,5
Stewardship	3,4	5,5	5,5	5	5,5,5
Policy	1,2	5,5	5,5	5	5,5,5
Trust	1,5	5,5,	5,5	5	5,5,5
Foreign industry	1,4	4,5	5,4	3	3,5,5
Prioritization	1,1	3,5	5,4	4	3,3,5

Industry Roles	Small Business	Public Interest	Fed Govt	State Govt	Industry
Trust	1,5,5	5	5,5	5	5,3,5
Lead by example	3,5	5,5	5,5	5	4,5,5
Retrieve info for general dissemination	3,3,2	4,2	4,3	3	3,2,3
Develop and implement tools	4,2,3	4,3	4,4	3	4,3,4

Table B-7. (continued).

Identify need	3,5,4	4,5	5,5	5	5,5,5
Prioritize	1,2	5,4	5,4	5	4,3,5
Generator of ultimate \$ to sustain	3,3	4,5	4,2	5	4,3,5
Market-driven technology & research	1,3	4,5	4,4	5	5,5,5
Stewardship	3,2	5,5	5,5	5	5,5,5
Foreign industry lead	4,1	3,3	1,2	2	3,2,4

State Government Roles	Small Business	Public Interest	Fed Govt	State Govt	Industry
Trust	5,5,1	5	5,5,5	5	5,3,4
Cost conscious of how \$ are used	5,5,3	5	5,5,3	5	5,5,5
Risk communication to public	2,5,1	5	5,5,4	5	5,5,5
Risk assessment prior to communication	2,5,2	5	5,4,2	5	4,5,5
Lead by example	5,5,4	5	5,4,2	5	5,5,5
Provide marketing assistance to small business	5,1	5	5,2	5	5,5,5
Retrieve info for general dissemination	3,3,1	3	4,3	3	3,2,2
Criminal and civil penalties	2,5,4	5	4,4	4	3,2,2
Policy	3,1	5	5,5	5	5,5,5
Market-driven technology & research	4,2,1	5	5,3	5	5,5,5
Stewardship	5,5,4	5	5,5	5	5,5,5

Academia Roles	Small Business	Public Interest	Fed Govt	State Govt	Industry
User friendly information mechanisms to public and others	3,1	2,5	3,5,4	4	2,2,3
Get together engineering resources	2,1	2,5	4,3,3	3	3,2,3
Drop elite, turfdom aura	3,2	5,5	4,4,4	2	5,3,3
Retrieval of information for general dissemination	4,3	5,5	4,5,4	4	3,2,3

Table B-7. (continued).

Market-driven technology and research	4,1	5,5	5,5,4	5	4,5,4
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Public Roles	Small Business	Public Interest	Fed Govt	State Govt	Industry
Prioritization	4	5,5	5,5,5	5	4,4,5
Demand accountability of cost and values of government	5,1	5,5	5,5,5	5	4,5
Acknowledgement that there is risk	4,2	4,5	5,5,5	5	5,3,5
Accept financial burden (tax liability)	3,1	5,5	5,4,5	4	3,5,5
Assume responsibility for self education	5,1	5,5	5,3,5	5	5,5,5
Stewardship	5,3	5,5,	5,5,5	5	5,5,4
Trust	5,1	5,5	5,4,5	5	2,5,5
Accepting all costs (not only \$)	3,2	5,5	5,4,5	4	4,5,5

Small Business Roles	Small Business	Public Interest	Fed Govt	State Govt	Industry
Entrepreneurial Drive	5,5,1	5	5,5,4	5	3,4,5
Develop and implement tools	3,4,1	3	5,4,4	4	3,4,4
Identify needs	4,5,4	3	5,4,5	5	5,5,5
Generator of \$ to sustain	4,3,2	5	4,3,2	3	3,3,5
Market-driven technology and research	3,3,2	5	5,5,5	5	4,3,4
Stewardship	5,5,4	5	5,5,5	5	5,5,5
Trust	5,5,2	5	5,5,5	5	3,3,5
Prioritization	3,5,2	4	5,5,4	5	3,3,4

Table B-8. Environmental Infrastructure Concerns.

Infrastructure	Small Business	Public Interest	Fed Gov	State Gov.	Industry
Fund existing infrastructure so it functions	2,2	5,5	4,3,5	4	4,5
Appropriate adequate \$ for agencies responsible for sustainable development	2,1	5,5	4,4,5	4	4,5
Industry mentoring of small business	5,1	5	4,4,3	5	3,4
Constitutional Amendment for sustaining national resources	2,4	1,1	3,3,3	1	2,2
State government and state universities should work together	1,1	3,3	3,3,3	4	2,4
Databases should be publicly available	4,1	4,2	4,5,3	4	3,4
Encourage and promote two-way dialogue	1,1	2,5	3,4,3	5	3,5
Removal regulatory conflict	3,4	4,5	4,3,4	2	5,5
Consistent regulations	4,2	4,5	5,5,5	3	5,5
Streamline regulations	4,2	4,5	5,5,3	3	5,5
Encourage incubators for small business	5,1	5,5	5,2,2	4	3,5
Large business provide workshops for small business	5,1	5,5	4,3,2	4	3,4
Every tax-supported library available to everyone	2,1	2,5	3,3,4	3	2,3
Public access to national laboratories information networks	1	3,5	4,4,3	4	2,3
Infrastructure needs national policy on sustainable development	2,1	2,5	4,3,5	2	5,5
Clearly defined goals for sustainable development	3,1	5,5	5,4,5	3	5,5
System needs user input	3,2	5,5	5,5,5	5	3,5
Country needs vision of sustainable development	3,1	5,5	5,5,5	4	5,5
New system of voter referendums for environmental issues	2,2	1,5	4,4	4	4,5