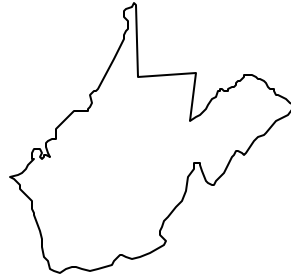




RESOURCES . . . INNOVATION . . . RESULTS
promoting long-term industrial partnerships
INDUSTRIES OF THE FUTURE—WEST VIRGINIA



PROCEEDINGS

INAUGURAL SYMPOSIUM Industries of the Future—West Virginia

*Robert C. Byrd Health Sciences Center — Charleston Division
December 1-2, 1997*

ORGANIZED BY

West Virginia University

CO-SPONSORED BY

National Research Center for Coal and Energy

West Virginia Development Office

U.S. DOE Office of Industrial Technologies

The Aluminum Association

American Iron and Steel Association

Society for Glass Science and Practices

West Virginia Manufacturers Association

West Virginia Forestry Association

West Virginia Manufacturing Extension Partnership

EXECUTIVE SUMMARY

Industries of the Future - West Virginia (IOF-WV) is motivated by the U.S. DOE Office of Industrial Technologies (OIT) Industries of the Future program, which focuses on increasing productivity of energy intensive industries through enhanced energy efficiency, waste minimization/utilization, and use of new technologies. The IOF-WV program targets aluminum, steel, glass, chemicals, and wood/forest products, prominent industries in West Virginia whose continued viability and global competitiveness are crucial to the economy of the state. The goal of IOF-WV is to be a catalyst for programs, projects, and partnerships which will contribute to a bright future for these and other energy intensive industries in the state.

The December 1-2, 1997 *Inaugural Symposium on Industries of the Future - West Virginia* was a forum for West Virginia industry, government, and academia to exchange ideas on needs, programs, and priority projects to benefit West Virginia's aluminum, steel, glass, chemicals, and wood products industries. Breakout groups on these five sectors held work sessions on the first day of the symposium to develop priority project ideas. Cross-cut breakout groups met later in the day to discuss issues of across-the-board concern to the state's industries. The results of all 10 breakout groups are summarized in this proceedings.

Dr. Charles Manning, Chancellor of the WV Board of Trustees, and Dr. John Carrier, President of WVU Institute of Technology, addressed Symposium participants at dinner on Monday evening, December 1. Larry Kavanaugh, Vice President for Technology, American Iron and Steel Institute, presented the dinner talk on IOF steel industry programs.

In his opening remarks on Day two of the symposium, WVU President David Hardesty discussed challenges to research and education programs in support of the state's industries. Three perspectives on coalitions and strategies for industrial development were presented in a panel chaired by John Snider, Director of Industrial Development, WV Development Office. Governor Cecil Underwood presented a comprehensive speech on strategies for strengthening West Virginia's basic industries, and Denise Swink, U.S. DOE Deputy Assistant Secretary, emphasized the leading role that industry has in developing visions and technical roadmaps for the IOF program. The closing panel, which included Governor Underwood, State Senator Lloyd Jackson, Denise Swink, Tom Burns, Executive Director of the WV Department of Development, and Dr. Sam Tully, Chief Technology Officer, Governor's Office, focused primarily on education and training issues as they pertain to the workforce of the future.

The cooperation and support of the U.S. DOE Office of Industrial Technologies, the West Virginia Development Office, the Office of the Governor of West Virginia, and the Office of the President of West Virginia University are very much appreciated. The involvement of key WVU research teams is instrumental to the success of IOF-WV, as is the continued participation of West Virginia industry leaders.

The Office of the Vice President of the Charleston Division of the Robert C. Byrd Health Sciences Center was very helpful and cooperative in planning and executing the symposium. The WVU National Research Center for Coal and Energy has been very supportive and helpful with the IOF-WV effort. Finally, the monetary support provided to IOF-WV through State Energy Program funds administered by Jeff Herholdt in the WVDO Energy Efficiency Program is gratefully acknowledged.

Carl Irwin
West Virginia University
National Research Center for Coal and Energy
March 23, 1998

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TABLE OF CONTENTS

Executive Summary ii

West Virginia University IOF-WV Team iii

Partnerships: An Intergal Part of Industries of the Future
 David C. Hardesty, Jr.
President, West Virginia University 1

Industry Sector Groups Breakout Sessions 7
 Aluminum 8
 Steel 10
 Glass 12
 Chemicals 14
 Wood/Forest Products 17

Cross-Cut Groups Breakout Sessions 19
 Group A 20
 Group B 21
 Group C 22
 Group D 23
 Group E 23

Strategies for Industrial Development in West Virginia
 Panel Presentations 25

Strategies for Strengthening West Virginia’s Basic Industries
 Honorable Cecil H. Underwood
 Governor of West Virginia 32

Summary, Synergies, and Strategies for IOF-WV
 Denise Swink
 Deputy Assistant Secretary for Industrial Technologies, U.S. Department of Energy . . . 39

The Government’s Role in Industrial Development
 Panel Discussion 42

Conclusions and Future Plans 49

Appendix

1. Symposium Participant List A-3
2. Symposium Agenda A-13

PARTNERSHIPS: AN INTERGAL PART OF INDUSTRIES OF THE FUTURE

David C. Hardesty, Jr.

President, West Virginia University

Thank you, Carl, and good morning everyone. I want to add my welcome to those of you that have decided to take advantage of what may be an important activity in the history of our state. I am happy to be here.

It is very rare that one can be at the inception, especially if you're the President of a University, but I happened to be at the meeting where the seeds of today's symposium were planted. I think the reason it came about is worth sharing with you.

Denise Swink and other officials of the Department of Energy were in Morgantown to talk to us about our Carbon Products Consortium. (This, by the way, is a great program that we at WVU co-sponsor with the leading producers of carbon products in the country. We are developing new ways to convert coal into high-value carbon products.)

While talking with the DOE officials, we learned that DOE had developed an interest in taking traditional industries into the 21st Century by foreseeing the creation of new industries, new product lines, new processes, and new competitiveness for traditional industries. As we looked down that list, we saw that most West Virginia industries were on the list. I saw "aluminum," and was familiar with the Ravenswood works and how important Century Aluminum is to the world market. I saw chemicals, and I had just returned from talking to plant managers of the chemical industry in West Virginia. I noticed forestry and wood products and I am always aware of the presence of Dick Waybright. I saw coal, and I thought of the people in the coal industry. We looked at the list and seven of our industries were there.

Then, I shared with the group the research focus areas for West Virginia University. They are: **Advanced Materials** (which cuts across a large number of industry lines); **Energy and the Environment** (which has to do not just remediation, but actually cost cutting with regard to energy and new ways of handling energy problems); **Information Technology; Economic Development; Human Resources and World Culture**; and **Molecular and Biomedical Sciences**. We at West Virginia University had already decided that we were interested in many of the very industries on which the Department of Energy was focusing. Out of that meeting was born the nation's first state-level conference on Industries of the Future.

Well, the five sectors of the economy that this symposium focuses on are important not only to West Virginia, but to the United States as well. These sectors represent one-seventh of the trade merchandise produced in the United States. They also account for eighty percent of the industrial energy consumption in the United States and produce eighty percent of the industrial waste.

So, you are here in the heartland of America talking about the heart of the industrial might of America and its future. And I think that is seminal. It is quite possible that by being the first statewide IOF symposium, what happens here could be a prototype for what happens around the country, and it could certainly alter what happens in basic industries in this region of the country.

We are very happy to partner with you today and with the U.S. Department of Energy. I thank them for their leadership, and thank you for coming. I'm an optimist by nature, and as we look to the future I like to be optimistic and see the glass more than half full. I'm reminded that only twenty years ago the CEO of a major computer company surmised that there would be no reason why anyone would need a computer in their home. That was just twenty years ago, and that CEO was dead wrong. So, we need to see into the future, but we need to discern it well and discern it clearly.

I want each of you here today to know that you have a significant potential partner in West Virginia University. I want to talk a little bit about our philosophy and how we are trying to posture ourselves toward your industries. It will take time to do that effectively, but it is what we want to do.

We are a significant institution. Only about seventy-five institutions in the country have our kind of profile. We are a comprehensive institution, meaning that we do teaching, research, and service in a variety of disciplines. We offer about a hundred and sixty-five majors, and within those majors are several different sub-specialties. So, we are comprehensive.

Secondly, we are a land grant institution which, in the language of higher education, means we have a three-part mission of teaching, research, and service.

We are a Research I institution (as designated by the Carnegie Foundation). We are very proud of the work we do in a wide variety of fields and are glad to achieve that recognition not just for our own institution, but for the entire state. To have a Research I institution dedicated to the state is a very, very important fact.

I'm pleased also to note the presence today of John Carrier who is our partner, affiliated with us through the West Virginia University Institute of Technology in Montgomery. We also have programs in Parkersburg, Keyser, here at the Charleston Division, and at numerous sites throughout the state via extension, distance learning technology, and faculty outreach.

We live in a changing world. Higher education faces the same kind of challenges and issues that you face. We are a very significant employer, and because we are a complex knowledge organization we have many of the same problems that you do. We face global competition with its attendant incessant drive for quality. We have about a thousand students from around the world who study just at WVU. We also place our students and our researchers and those engaged in extension around the globe. We must compete, just as you must compete.

We live in a society which is advancing technology very rapidly, and it is just amazing what technology is doing to the college campuses of America. We, like you, are installing computer systems that are very expensive and figuring out how to keep them up and pay for them. Like you, we are

seeing the impact of worldwide communications on organizations, and we are seeing technology advances that are doubling and tripling our knowledge every year. When I was in school, Dr. Paul Miller, who was then President of the University, told our freshman class, "knowledge doubles every ten years, so be prepared to be a lifetime learner." I told our freshman class, at the freshman convocation for the class of 2000 one year ago, that it doubled every four years. And, it is predicted that by the year 2010 college presidents will tell their students that knowledge doubles every year. Now, contemplate *that* if you are in the knowledge business. Contemplate the expansion of the product line, so to speak, by one-hundred percent every year.

Given the changing times in which we live and the changing nature of the American economy, we have adopted the following mission statement:

WVU is a student-centered learning institution meeting the changing needs of West Virginia and the United States through teaching, research, service, and technology.

We recognize up front, in how we describe ourselves, that the transmission of knowledge to the knowledge worker is of critical importance to the future of our country. We recognize a changing environment in which our work must take place. We recognize our mission of teaching, research, and service, and the importance of technology. Let me talk about each of these areas just briefly.

First of all, I think we are reconceptualizing how we approach the student at West Virginia University. I made a chart which I have not yet used at the University, but it helped me conceptualize what I thought we were about with students. It begins with the teaching of their teachers. We must address the concerns of the public education system in West Virginia. We have the research base to do that and we have the teaching skills to teach the teachers to do that. I know the kind of workforce you get is of critical importance to you. We are looking at the student at that very basic level.

Secondly, we're trying to interest our students in careers of the future. We're reaching down into the high school through programs like our HISTA Program, which seeks to interest students who would not otherwise be interested in programs like health sciences. We are reaching into the seventh and eighth grades and saying, "If you want to succeed at biomedical sciences like medicine, dentistry, pharmacy, and nursing, you must begin now, before you enter high school, to study math and science, and be motivated!" And, it's working.

We're interesting students in careers at a very early age, before they come to us. When they come to us we are asking them to think about what they want to do with their lives, what majors will get them there, and what kind of summer experiences will make them more prepared for the work force. We're helping find the jobs that match their skills and then we are working with them in the first two years to make sure that they are really anchored in the work place.

But WVU's approach involves more than traditional classroom academic programs. What we are doing is to approach students from a holistic philosophy. We realize that workers of tomorrow must have the ability to learn across their lifetimes, while at the same time having the entry level skills you need. They must be talented at getting along with others in order to lead in the workforce. We are trying to train the leaders of the industries of tomorrow at our University. But, the point is that the worker of the future must be motivated very early, as early as middle or elementary school. They must

have some idea of what may be out there, something that they may have never seen before; they may eventually have a job that is not yet invented. When they come to our University, they must get globally competitive skills, the ability to learn across their lifetime, and the interpersonal skills and vision to lead them into the workforce. One of the relationships we want to have with you is to understand what kind of workers, professionals, scientists, and engineers you need.

Secondly, we want to engage in research that is focused, that is relevant, and that is meaningful. We are trying very hard to do that at West Virginia University. There are various kinds of research going on about which you may not have heard. I've already mentioned the Carbon Products Consortium. It's one of the more developed and interesting things that we have going. In this program we create new products out of carbon derived from coal and other traditional carbon-bearing minerals and substances. Other research programs have to do with improving airplane safety. Specifically, we are working on the concept of a neural network control system for an airplane, a thinking device which assists when part of an airplane is disabled. That's the kind of research that is meaningful, relevant, and important. At West Virginia University we're also looking at alternative fuels and new kinds of engines and hybrid engines, as well as new wood products, such as wooden bridge decks. These cut across your fields and are of broad interest. We're trying to help the chemical industry through the polymer alliance and other relationships that we are building with industries here in West Virginia.

Overall, we want our research to be of value to West Virginia industries, and believe that our research focus areas are supportive of this goal. It is not an exclusive list of what we do, but we want to be really good in the focus areas that we've talked about. As part of this and as part of our service mission we're trying to engage the real significant industries and employers in our state. We call them partnerships, but they take a variety of forms such as collaborations, research contracts, joint projects, consortiums, and so forth.

Let me give you some examples. First of all there are, of course, the projects with the other colleges in the state. And we have a number of them, with almost every other college and university and with numerous colleges and universities around the world. In fact we have fifty-two agreements with foreign universities. Secondly, we are picking up on industries that are located close to the University campuses, for example, NASA. What NASA does in Fairmont at the building owned by WVU is software validation and verification. The most complex command in the NASA computer world, a set of commands for NASA's current space equipment, is five million lines. That's what it takes to do some of the Hubble Telescope and Shuttle-type activities. The Space Station will take seventy-five million lines of computer commands. NASA would like to know that their software works before it goes up there. Working with the WV High Technology Consortium, NASA, and the WVU Department of Computer Science and Electrical Engineering, we have founded the Institute for Software Research. The institution is looking for ways to validate and get to state-of-the-art validation of such complex computer commands. Similar programs are underway with NIOSH, EPA, and the FBI.

We are also interested in the environment. We have clearinghouses at NRCCE in Morgantown that are national in scope and we see more clearinghouses coming about. One of the things we're working on is a Workforce Clearinghouse. We want to be able to go all the way from a particular skill development program to certain kinds of credentials for new and existing employers here in West Virginia.

Working with economic development organizations we're developing a High Tech Park for the Morgantown area. I can envision the day when we would be the driving force behind new business developments across the region.

My point is that in teaching students, in doing our research, and in doing our service we want to *engage* your companies. We want to *engage* your organizations, we want to *engage* your governmental agencies. We want to be meaningful, relevant, and significant to this state—not just this state, but to the country—because West Virginia is changing and needs institutions like ours. It's not coincidental that two years after we announced that we were going to be a more student-centered institution and engage our state, the land grant institutions put out a paper called "Returning to Our Roots." We are all moving in that direction. This is where land grant universities began: helping people and educating future leaders who have the technical expertise to lead America. This is where they have returned to and where they will stay for the foreseeable future.

Finally we are using technology to serve, to operate, and to learn ourselves. We are connecting our campuses and will be more connected in the future. Eventually, we'll be better able to tie statewide groups together. We are connecting with our clients and are developing technologies at West Virginia University that are going to be state-of-the-art. We are a driving force behind the fiber optic network that Bell Atlantic has developed. This technology will enable massive amounts of information to flow around West Virginia more easily than in almost any other state in the country.

In closing, I want to agree with Mark Twain, "prophecy is a difficult art especially with respect to the future." What you're about here is a difficult undertaking, but it's an important undertaking. It is important to sit down at a symposium like this and think about the future of your industry. Technologies are of critical importance not just to your company, but to the American economy and American competitiveness. We couldn't be more delighted to be a part of your work.

Again, I thank you for coming. I hope you find the meeting very helpful. I want to reiterate our desire to partner with you. We want to help you solve problems. We want to supply you with leaders for your organizations. And we want in every way we can to serve the people who pay for and sponsor West Virginia University. Thank you very much.



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INDUSTRIES OF THE FUTURE—WEST VIRGINIA



INDUSTRY SECTOR GROUPS BREAKOUT SESSIONS

Aluminum

Steel

Glass

Chemicals

Wood/Forest Products

Aluminum Industry Group Breakout Session

Session Chairs: Richard Love, Century Aluminum Corporation
Hank Kenchington, U.S. DOE, Office of Industrial Technologies
John Zondlo, WVU, Chemical Engineering
Muhammad Choudhry, WVU, Computer Science and Electrical Engineering

Introduction

The aluminum sub-group for the Industries of the Future - West Virginia program met in a brainstorming session to arrive at some consensus on research needs critical to the future of the aluminum industry in West Virginia. In attendance at the meeting were representatives from the coke industry, the process control industry, the metal matrix composite industry, the aluminum smelting industry, the coal-tar pitch industry, and the academic research sector. In addition, Hank Kenchington, the aluminum industry team leader from the U.S. Department of Energy was also in attendance.

The meeting began with an overview from Kenchington regarding the primary mission of the Industries of the Future program at the national level and the aluminum industry in particular. Kenchington stressed the two overriding issues in the IOF charter were the reduction of energy consumption by the aluminum industry and the improvement of environmental quality. He discussed briefly the current and projected budgets for the aluminum segment of the IOF. He also outlined some of the more significant research areas as embodied by the aluminum industry vision statement and road map. In particular, Kenchington cited the following as areas of research receiving high priority by the IOF: the development of inert anodes, the issue of CO₂ reduction as related to global warming, recycling of aluminum and aluminum byproducts, and the increased use of aluminum in the PNGV program.

Following the presentation by Kenchington, the group identified potential problems or research needs for the aluminum industry particular to West Virginia. An entire list of the ideas follows in the next section.

Projects Identified by the Aluminum Industry Group

The question, "What specific projects should be undertaken to increase productivity and reduce costs in the aluminum industry through improved energy efficiency, reduced material waste, use of new technologies, better inventory and management systems, etc.?" was provided for the group's consideration. It was suggested that an identified project be such that it can generate an impact within two years, that it can be accomplished using existing resources, and that it is supported by the present aluminum industry. The following is a list of ideas generated during the brainstorming session:

- Understand anode property optimization
- Reduce cost of electricity
- Develop central anode processing sites
- Capture CO₂ and develop uses for CO₂

- Find uses for brazing-sheet scrap
- Identify various alloys for recycle (eddy current or x-ray fluorescents)
- Simulation of casting and extrusion for improved productivity
- Develop coal-based anodes and cathodes
- Develop “best-practices” model for management/automation system
- Improve anode-effect prediction methods
- Increase efficiency of scrubbing systems
- Identify critical equipment to reduce down time
- Develop secure sources, production, and application of coal to meet targets
- Reduce transmission losses on power lines
- Eliminate chlorine in casting degassing
- Investigate value-added materials for replacement of present applications at lower costs
- Study cracking mechanisms of ingots
- Increase purity of Al_2O_3 feedstock
- Investigate “local” power generation
- Recover waste heat from pot rooms, etc.
- Attack SO_2 problem from pots
- Improve systems for process monitoring (on-line)
- Improve methods to measure current in tight places
- Improve coatings to eliminate H_2O stain
- Reclaim Al_2O_3 and reduce losses
- Model reduction process (dynamic)
- Model energy input/output
- Make inroads into river barge industry
- Understand bag house and scrubber operation
- Develop regional inventory and purchasing networks
- Reduce air and CO_2 reactions at anode surface
- Develop alternative extenders for coal-tar pitches
- Improve recovery of fabricated products

The group then identified the top six topics for future research efforts. These six ideas along with a contact person for each are as follows:

1. The reduction in the cost and use of electricity especially in light of proposed deregulation of the electric industry. Contact person: Muhammad Choudhry (WVU)
2. Improved on-line process monitoring systems, particularly focused on increasing quality and energy monitoring and minimization. Contact person: Jan Berkow (TMC Technologies, Inc.)
3. The development of coal-based anodes and cathodes including cokes and binder pitches. Contact persons: Ron McHenry (Koppers Industry) and John Zondlo (WVU)

4. Reduction of the air and CO₂ reactions at the carbon anode in the smelting pot. Contact person: Mark Krock (VENCO)
5. High value uses for scrap radiator brazing stock. Contact person: Jorge Deschapelles (Century Aluminum)
6. Recovery of waste heat from pot rooms, anode furnaces, etc. Contact person: Richard Love (Century Aluminum)

Each of these sub-groups will gather data on the six topics listed above with the goal of establishing research teams from West Virginia industries and universities. Moreover, where appropriate, proposals will be prepared and submitted directly to the IOF Program of the DOE Office of Industrial Technologies in Washington, DC.

Steel Industry Group Breakout Session

Session Co-Chairs: Tom Danjczek, Steel Manufacturers Association
Scott Richlen, U.S. DOE, Office of Industrial Technologies
Ken-Minn Chang, WVU, Mechanical and Aerospace Engineering
Bob Creese, WVU, Industrial and Management Systems Engineering

Introduction

The breakout group consisted of 19 professionals representing a cross-section of industry, academics, and support at all levels. The participants were very vocal, making for good interaction. The session began with an OIT presentation by Scott Richlen who described the purpose of a "Steel Industry Roadmap," explaining the importance of having one document to focus efforts on the same agenda, same issues for research, etc. He also spoke of national labs with existing technologies and capabilities to adapt these technologies to industry as well as the Motor Challenge Program and expert workshops (i.e., sensor and controls). Finally, he gave examples of \$9 million of funding in 1998, including the AISI Cooperative Agreement and the Advance Process Control.

Projects Identified by the Steel Industry Group

The question, "What specific projects should be undertaken to increase productivity and reduce costs in the steel industry through improved energy efficiency, reduced material waste, use of new technologies, better inventory and management systems, etc?" was provided for the group's

consideration. It was suggested that an identified project be such that it can generate an impact within two years, that it can be accomplished using existing resources, and that it is supported by the present steel industry. The following is a list of ideas generated during the brainstorming session:

- Reduce casting costs (near net shape, thin, speed, clogging, productivity)
- Reduce energy costs (joint with utilities, 15%)
- Reduce costs--keep it cheap!
- Refractories
- Electrodes
- Workmen's Compensation
- Improve cleaner steels--quality
- Evaluate workplace, workforce upgrades
- Degreed professionals--availability and shortfall
- Production workers skills required
- Reduce construction costs
 - Trade labor productivity
 - Permits
 - Licenses
- Alternative coatings to replace tin and zinc
- Find alternatives to coke/coke substitutes
- Identify environmental issues
 - PM2.5
 - NO_x
 - Chrome free passification
- Provide coal-based replacements for graphite-electrodes, molds, and cokes
- Provide technologies to assist in stabilizing energy consumption
- Consider co-generation of electricity from waste heat
- Determine effects of deregulation of electricity
- Control energy demands costs
- Consider regulatory issues for generating hydro-electric power
- Improve sensor technologies
- Reduce in-process inventories
- Reduce over capitalization
- Improve maintenance reliability
- Find sensor technology for anneal steels
- Reduce transportation costs

The following were the highest ranked ideas that should be pursued, as suggested by the steel industry participants.

1. Costs - energy reduction
 - Establish an industry/utility group to study opportunities

2. Casting - technologies
 - Assist Steel of West Virginia, Inc. in their near net shape casting development
 3. Galvanized steel - white rust
 - Develop non-chromium based chemical passification. Seek assistance from chemical industry
 4. Process control sensors
 - Establish workshop for information transfer
 5. Roadmap review
 - Establish group from WVU to review and determine where university can assist.
 6. Workforce upgrade
 - Use WV Steel Advisory Commission
-
-

Glass Industry Group Breakout Session

Session Co-Chairs: Beri Fox of Marble King, Inc., Padon City, WV
 Tom Fenton of Fenton Art Glass Company, Williamstown, WV
 Theo Johnson, U.S. DOE, Office of Industrial Technologies
 Ed Sneckenberger, WVU, Mechanical and Aerospace Engineering
 B. Gopalakrishan, WVU, Industrial and Management System Engineering

Introduction

Theo Johnson informed the group that participants from industrial companies in the on-going national-level program can be grouped into three categories: 1) Chief Executive Officer of Company, etc, 2) Vice President of R&D, etc, and 3) Lead Production Person of Plant, etc. The percentage of industrial participants in each category is currently about 10, 30 and 60%, respectively; these percentages need to become closer to 50, 30 and 20%, respectively, so that a company's commitment to IOF projects is more assured. Participants from academic institutions, national laboratories and external suppliers were important contributors to the overall scheme and success of the national-level program, and their involvement in the state-level programs is encouraged.

Basically, the glass industry for the national-level IOF has been defined into four segments: Flat Glass, Fiberglass, Container Glass, and Pressed/Blown (Specialty) Glass. Trade organizations such as the Glass Packaging Institute (GPI) of Washington, DC and the Society for Glass Science and Practices (SGSP) of Weston, WV provide leadership for some of these segments. Currently, however, none of these organizations is a recognized lead association for the entire glass industry. The American Ceramic Society (ACS) of Westerville, OH has offered to be the single-voice association for the glass industry. Alternatively, a new Glass Industry Technical Council (GITC) has been proposed.

Projects of interest to the glass industry participants for the national-level program have focused on four areas: Production Efficiency, Energy Efficiency, Environmental Protection/Recycling, and Innovative Uses. The team leaders, respectively, for these four areas of project interest are Vince

Henry of Ford Motor Company in Detroit, MI, Jim Shell of Techneglas in Columbus, OH, Foster Harding of John Mansville in Denver, CO, and Fred Quan of Corning, Inc. in Corning, NY. Projects that are of a pre-competitive nature to the general glass industry have been identified and pursued. For information about the national-level program, contact Theo Johnson, of the U.S. DOE, Office of Industrial Technologies

Projects Identified by the Glass Industry Group

The question "What specific projects should be undertaken to increase productivity and reduce costs in the glass industry through improved energy efficiency, reduced material waste, use of new technologies, better inventory and management systems, etc?" was provided to for the group's consideration. It was suggested that an identified project be such that it can generate an impact within two years, that it can be accomplished using existing resources, and that it is supported by the present glass industry.

A list of 15 ideas was generated during a structured brainstorming session:

- Develop improved refractory material at reasonable price
- Seek production techniques to minimize waste/recycle
- Develop quality-specific sensors for product and process
- Develop improved sensor/control technology
- Improve modeling of glass melting process
- Perform DOE/Taguchi methods to improve process variables
- Develop cost/energy/productivity model for improved business
- Enhance the accessibility of glass-making equipment
- Develop emissions control technology for small/medium producers
- Define additional procedures for the reuse/recycle of glass
- Illustrate the advantages of new energy/environmental technologies
- Develop oxygen sources that are economical for small/medium plants
- Explore alternative materials/uses for glass-like industries
- Specific alternatives to the melter for energy efficient purposes
- Devise ways to measure/control glass properties; e.g. coefficient of expansion

Following the brainstorming session a prioritization process was used to rank the specific projects identified by the Glass Industry Group. The nominal group technique enabled the above list of 15 project statements to be ranked. A top three 5-3-1 vote by each of 10 group members who voted yielded for each project the vote totals as shown below in parentheses to the right of the project statements. The top three recommended projects were essentially rated about the same. The fourth and fifth recommended projects were rated nearly equal, receiving about 50% of the vote total in comparison to the top three recommended projects.

After the top five project statements were identified, projects with statements similar to the top three projects were then included as subprojects to these top three projects.

- 1.(Tie) Seek production techniques to minimize waste/recycle; e.g. crackoff. (16)

- Develop quality-specific sensors for product and process.
- 1.(Tie) Develop improved refractory material at reasonable price.(16)
 - Develop improved sensor/control technology.
 3. Improve modeling of glass melting process. (15)
 - Perform DOE/Taguchi methods to improve process.
 4. Develop oxygen sources that are economical for small/medium plants. (9)
 5. Enhance the accessibility of glass-making equipment. (8)

Future Actions for the Glass Industry Group

Efforts will be made to extend the current IOF-WV Glass Industry Group to become a more comprehensive representation of the state's glass industry, especially the flat glass segment. This will enable broader-based plans to be formulated for a state-wide IOF program.

A six-member Steering Committee was formed by the IOF-WV Glass Industry Group. The members selected were Beri Fox of Marble King in Paden City, WV, Tom Fenton of Fenton Art Glass Company in Williamstown, WV, Ray Dalton of Fibair in Reedsville, WV, Jim Jacobs of Corning Consumer Products Company in Martinsburg, WV, Reinhard Maennl of Schott Scientific Glass in Parkersburg, WV, and a flat glass industry participant of AFG Industries in Bridgeport, WV.

Plans Formulated by the Glass Industry Group:

Each of the five recommended projects listed above will need to be described in terms of its future impact on the various segments of the state glass industry. These project descriptions will need to be prepared by teams of Glass Industry Group members from industrial companies, as well as external suppliers, national laboratories and academic institutions.

Each of the five recommended projects listed above will need to be associated with sources of possible funding. Sources of possible funding at the federal level centered on USDOE/OIT Programs, which received \$1.5M in FY97 to fund IOF projects, and has received \$2.0M in FY98 to fund additional IOF projects. Also, the USDOE/OIT Program receives other funds to support projects through established industry-focused activities such as its NICE³ Program. Two main emphases of projects that receive these funds are to build industrial commerce and to promote energy efficiency. The possibility for submitting unsolicited projects to the USDOE/OIT for funding was considered a quite viable option.

Sources of possible funding for projects at the state level mostly centered on opportunities through the West Virginia Development Office (WVDO). Group discussion included considering the possibility of initiating state-level support for a \$1.0M NICE³ type program in West Virginia, with alternative percentages for the industrial company's matching funds. Recognition was given to the continuous funding that has been obtained for more than ten years by the Energy Efficiency (EE)

Program of the WVDO for assisting the glass industry. The most recent WVDO/EE Program support was for the Glass Industry Technical Initiative (GITI) Program, which is currently in progress.

Chemicals Industry Group Breakout Session

Session Chairs: Bill Forrester, Bayer, Inc.
Doug Faulkner, U.S. DOE, Office of Industrial Technologies
Bruce Cranford, U.S. DOE, Office of Industrial Technologies
Garth Thomas, WVUIT, Chemical Engineering
Gene Cilento, WVU, Chemical Engineering

Introduction

The Vision 2020 document for the chemical industry was ratified in 1997 by the American Institute of Chemical Engineers (AIChE), the American Chemical Society (ACS), the Chemical Manufacturers Association (CMA), and the Council for Chemical Research (CCR). At recent annual meetings of these societies, subcommittees have been forming to develop the roadmap for implementation of this Vision. These subcommittees, which include representatives from academia, industry and government, will develop strategic plans for chemical measurements, unit operations, computers, biotechnology and catalysis. Considerable work will be needed by many volunteers to formulate and implement this roadmap for the chemical industry. There will be many challenges and opportunities in doing so, and the WV chemical industry needs to take a lead role in this effort.

In June 1997, a group of chemical industry leaders met at the University to discuss Vision 2020 as it pertains to the state chemical industry and the DOE Industry of the Future (IOF) program. At this meeting, a subgroup of these representatives formed to continue the discussion on issues pertaining to this industry. Several meetings were held at the WV CMA Office prior to the IOF-WV Inaugural meeting in Charleston on December 1-2, 1997. A significant priority of this subgroup is the improvement of the overall business climate in West Virginia, issues which will be best addressed by the CMA and chemical industry leaders in the State.

At the inaugural IOF-WV meeting, an important technical focus of the chemical industry breakout group was the expansion of the polymer industry in the State. The subgroup supported the idea of David Stanton and George Keller to explore the idea of attracting recreational equipment manufacturers into West Virginia. Presently, while all the polymers needed to make such equipment are produced in the State, there are no sporting goods manufacturers located here. Such companies would be attractive to continued West Virginia economic development.

The overall discussion for this first IOF-WV meeting was excellent. Several strong recommendations evolved from the chemical industry breakout group. Two are restated here: (1) determine the feasibility of attracting manufacturers of recreational equipment to West Virginia; and (2) help develop a polymer processing center and expanded programs at the University to support the state chemical industry. The chemical industry subgroup will lead the effort to explore the all key ideas

generated by this IOF-WV meeting. Proposal development to support state efforts in the areas identified and in response to IOF funding requests will be pursued.

Projects Identified by the Chemicals Industry Group

The question "What specific projects should be undertaken to increase productivity and reduce costs in the chemicals industry through improved energy efficiency, reduced material waste, use of new technologies, better inventory and management systems, etc?" was provided for the group's consideration. It was suggested that an identified project be such that it can generate an impact within two years, that it can be accomplished using existing resources, and that it is supported by the present chemicals industry. The following is a list of ideas generated during the brainstorming session:

- Develop cogeneration
- Need information service (resources, expertise, etc.)
- Need to help small companies
- Recruit consumer product companies to WV
- Develop better bridge for R&D to demonstration
- Bring value-added industry to WV
- Emissions reduction R&D
- Do pooled environmental services - recycling
- Sharing best-practices for energy conservation (benchmarking)
- Need R&D on new sensor technology - application in process control
- Need better technology for process control
- Extend "Freeport" on raw materials
- Need new technology for heat transfer
- Develop new alternative feedstocks - biomass, coal
- Need industrial study and evaluation of waste energy and materials
- Develop consortium to design recyclability into product/materials
- Study of factors that will retain the chemical industry in WV)
- Build a polymer program in the University, with a focus on processing extrusion, composite materials, new materials
- Study of energy utilization/conservation for small companies
- Study application of new separation technologies to waste minimization and emissions reduction
- Develop value-added uses for coal
- Develop consortium on waste water treatment
- Develop heat resistant/corrosion resistant materials
- Develop a catalysis center
- Need just-in-time manufacturing technologies for better inventory control
- Need better liquid heat transfer materials (non-toxic, etc.)
- Improve availability of continuing education and technical training focus

The following were the highest ranked ideas that should be pursued, as suggested by the chemical industry participants. An underlying premise was to develop Office of Industrial Technology (OIT) funding for any of the ideas below when it appropriate to do so.

1. Bridge the Chemical Industry to OEM's
 - Pursue the idea of attracting new industries into the state that make recreational products from chemicals produced by WV manufacturers
 - Invite downstream manufacturers here to help us develop IOF-WV roadmap
 - Use the Chemical Industry IOF Subgroup to coordinate this OEM effort
2. Develop a Polymer Program at the University
 - Industry needs expertise with extrusion processing
 - Need better screw designs to reduce wastes and energy usage
 - Need new R&D on materials and composites, testing, and uses
 - Study compounding problems that are common to chemical manufacturers
 - Develop a coalition to study common industrial polymer processing problems
3. Develop better waste minimization and recycle strategies
 - Need to develop new waste water treatment technologies
 - Need to design products for recycle
4. Develop a cogeneration energy facility

Wood/Forest Products Industry Group Breakout Session

Session Chairs: Lanny Williamson, Williamson Pallets, Inc.
Ingrid Watson, U.S. DOE, Office of Industrial Technologies
Tim Pahl, WVU, Appalachian Hardwood Center, Division of Forestry
Larry Banta, WVU, Mechanical and Aerospace Engineering

Introduction

The breakout group for Wood/Forest Products included a cross section of industry, association, agency, and academic professionals involved with wood products manufacturing. West Virginia industry was represented by five manufacturers from both primary and secondary manufacturing and by a representative of a utility company. The other ten or twelve participants represented industry associations, non-profit support groups, government agencies, and academia.

Ingrid Watson, of the Office of Industrial Technology, provided a brief overview of OIT programs. The group then embarked on discussions aimed at identifying the top research issues for West Virginia wood products manufacturing.

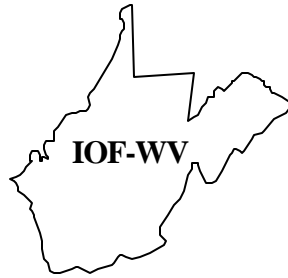
Projects Identified by the Wood/Forest Products Industry Group

The question "What specific projects should be undertaken to increase productivity and reduce costs in the wood/forest products industry through improved energy efficiency, reduced material waste, use of new technologies, better inventory and management systems, etc?" was provided for the group's consideration. It was suggested that an identified project be such that it can generate an impact within two years, that it can be accomplished using existing resources, and that it is supported by the present wood/forest products industry. The following is a list of ideas generated during the brainstorming session:

- Develop slicing operation versus sawing to reduce kerf waste
- Develop continuous technology for wood preserving
- Use steam to run process machinery
- What's new in steam generating equipment
- Thin kerf sawing technology advances
 - Develop new saw technologies
- Sawdust retention on board in problem with bandsaws
- Co-firing of wood residue with coal in power plants - also reduces sulfur emissions
- Wooddust listed as a carcinogen
- Study of real health risks for wood dust
 - Wood waste and sawdust boiler controls- improvements to increase efficiency and reduce stack emissions- need ways to monitor
- Improved corrosion resistant materials
- Sensors cannot now distinguish between defect wood and mineral stains - optical systems
- Find better ways to scan logs
- Optimize log breakdown and grade yield
- Cost reduction for recovering preservative chemicals from treated wood
- Variable frequency drives for induction motors
- Recycle boiler ash
- Research in alternative lubricants for saw blades
- Is there data available on the amount of forest which can never be harvested because it is public land? - Low impact logging and ecosystem manipulation

The following were the highest ranked ideas that should be pursued, as suggested by the wood/forest industry participants:

1. Log scanning technology to improve grade yield
2. Develop slicing or thin-kerf sawing technology
3. Improve efficiency of sawing, chipping, residue handling, etc.
4. Utilization of short-length lumber
5. Wood waste and sawdust boiler efficiency improvement



CROSS-CUT GROUPS
BREAKOUT SESSIONS

Cross-Cut Groups Breakout Sessions

Introduction

Cross-cut sessions included representatives from each IOF-WV sector: aluminum, steel, glass, chemicals and wood/forest products. During this session, representatives were asked to identify synergistic issues of cross-cutting interest, to recommend three to five critical strategies which would enhance manufacturing in West Virginia, and to discuss potential new consumer product manufacturing industries which would use intermediate materials produced in West Virginia.

Two questions were posed to each cross-cut group. First, "What are the critical, cross-cutting issues facing IOF-WV companies which have technology-based solutions?" Second, "What specific strategies do you recommend for enhancing the growth and global competitiveness of IOF-WV companies in West Virginia?" Brief notes on the brainstorming sessions follow.

Cross-Cut Group A

Session Chairs: Paul Joffe, Wiley, Rein and Fielding
Garth Thomas, WVUIT, Chemical Engineering
John Zondlo, WVU, Chemical Engineering

Question 1: Critical Issues

- R&D consortium to work with local/state government to deal with waste reduction
- Use waste between companies
- Pool of expertise available for consultation and coordination of waste
- Training for small companies in process control technology
- Smaller companies can assess and take advantage of new developments in process control
- Establish center of excellence at universities in state
- Ever changing environmental regulations as effecting our global competitiveness and technology transfer among various industries related to the environment

Question 2: Specific Strategies

- Streamline environmental permitting process
- Cooperative and sustained partnerships between business, government, and education to work on training, environmental regulations, workmen's compensation, export markets, etc.
- Higher education (centers of excellence) to assist industry with technical training and technology transfer-education should be responsive to needs of industry
- Availability of a trainable workforce especially in math and science, GED, etc.

Cross-Cut Breakout Group B

Session Chairs: Charles Sorrell, U.S. DOE, Office of Industrial Technologies
Bob Creese, WVU, Industrial and Management System Engineering
B. Gopalakrishnan, WVU, Industrial and Management System Engineering

Question 1: Critical Issues

- Recyclability of waste products; Use waste products as raw materials for other processes
 - Chemicals
 - Wood products
- Better environmental technologies
 - Waste water
 - Chromium
- Computer technologies
 - Process Controls
 - Sensors
- Advanced materials
 - Construction
 - Development
- Maintenance approaches
 - Equipment
 - Preventive maintenance
- Better energy demand management systems
- Funding better energy sources
- Robotic technology
 - Safety issues can be addressed
- Lack of education (technical) in high schools, colleges in the state
 - State assistance
- Lack of equipment for education
- Co-op program is important
- Share equipment resources among industries
- Information needs:
 - Energy/waste/productivity assessments for large companies
 - Impact of various types of emissions on environment
 - Development of specifications of materials for products and applications (material evaluation)

Question 2: Specific Strategies

- Support end products and semi-finished products

- Reduce cost of doing business in the state
 - Health care
 - Workmen's Compensation
 - Construction costs
 - Labor costs
 - Environmental costs
- Use space in buildings vacated by companies
- Active research for industry program in universities
- Keep industries we have and then build new opportunities
- Impact of various types of emissions on environment

Cross-Cut Breakout Group C

Session Chairs: Bill Raney, West Virginia Coal Association
Larry Banta, WVU, Mechanical and Aerospace Engineering
Muhammad Choudhry, WVU, Computer Science and Electrical Engineering

Question 1: Critical Issues

- Lack of trained/skilled workers at all levels, especially craft level
- Permitting requirements for business expansion prohibitive
- Need better methods for waste processing and disposal. Perhaps to include collaboration between industry and community
- Lack of infrastructure development
- Process efficiency improvement
- Permitting requirements prohibitive

Question 2: Specific Strategies

- Develop competent workforce
 - Alternative education programs
 - Technical/vocational schools
 - Partnerships for education and training between industry and academic communities
- Benchmark WV against other states
 - Develop more experienced and adequate in regulatory agencies
- Better methods for waste processing and disposal
 - Improve process efficiency
 - Create value added products from waste
 - Develop cooperative waste-handling ventures between companies and communities
 - Develop mentality that there is no waste
- Improve infrastructure in the broad sense:
 - Government/regulatory agencies

- Educational institutions
- Develop realistic vision for future of WV and strategies to implement it
- Develop internship programs starting at high school level

Cross-Cut Breakout Group D

Session Chairs David Lowe, Charles Ryan and Associates

Gene Cilento, WVU, Chemical Engineering

Keh-Min Chang, WVU, Mechanical and Aerospace Engineering

Question 1: Critical Issues

- Concern for Environmental Issues and Existing Regulations
- One-stop shopping
- Better, more streamlined permitting guidelines
- Fast track responses
- Concern for Technology Training and Retraining
- Better trained and more readily available workforce
- State supported training and retraining educational programs
- more accessible workforce
- Energy Issues
 - Generation capacity
 - Changing conservation laws
 - Regulations, and upcoming changes to regulations
 - Potential effects of de-regulation on power to WV industries
- WV Image as viewed by Industry/People Outside the State
- Costs of doing business
- Issues related to business operations (e.g., taxes, workforce, etc.)
- Media presentations of image of industry
- Need to Develop Better Modernization Strategies
- WV companies have older plants
- Need improved operational efficiencies to remain competitive

Question 2: Specific Strategies

- Need to develop better cooperation among all industries
- Need to develop a better common industry voice
- Need to combine forces to better resolve issues and problems
- Reduce "turf fights" and common problems
 - Expand the concept of the polymer alliance zone to other industries and areas of West Virginia

Cross-Cut Breakout Group E

Session Chairs: Roger Duckworth, WV High Technology Consortium Foundation
Tim Pahl, WVU, Appalachian Hardwood Center, Division of Forestry
Ed Sneckenberger, WVU, Mechanical and Aerospace Engineering

Question 1: Critical Issues

- Manage waste streams for all purposes: Environmental, recycling, conservation
- Use technology to solve environmental and safety issues
- Better legislation and permit procedures
- Legislation focused on data
- Increase pool of qualified workers
 - Programs to educate populace (public education)
 - Increase availability of on-site training with industry
 - Train quality and quality consciousness
- Improve transportation by all means
 - Land
 - Water
 - Air
- Industry/Utilities program to decrease energy costs
- Improve maintenance/reliability technology
- Identify coal-based opportunities for the industrial energy materials
- Reduce the cost of construction
- Improve national/global markets for West Virginia Industries

Question 2: Specific Strategies

- Environmental (Manage Waste Streams for all purposes)
- Identify existing flow streams (+/-)
- Benchmark flow streams by industry
- Use technology to:
 - Reduce (-)
 - Interconnect (+) flow stream
 - Enhance value added
 - Cross industry to minimize (-)
- Environmental (Use technology to solve environmental and safety issues)
- Identify present environmental standards
 - Identify each industry's footprint
 - Develop technology to transition from "as" to "must be"
- Training (increase pool of available/qualified workers)
 - Identify industry requirements for employment (benchmark other states)
 - Cause industry/education dialogue
 - Use technology to train the current shortfall on site

- Use technology to bridge the gap for those currently in the education system
 - Internet, CD-ROM, Simulators
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STRATEGIES FOR INDUSTRIAL DEVELOPMENT IN WEST VIRGINIA

Panel Presentations

Participants: **John Green**, Vice-President for Technology, The Aluminum Association
Brian Joseph, President, Touchstone Labs
Skip Lineberg, Manager, National Accounts, Business and Industrial Development,
West Virginia Development Office

Moderator: **John Snider**, Director of the Business and Industrial Development, West Virginia
Development Office

Moderator: There is a great need in this state to start looking at what we do long term in the industries that are being discussed here today. I'm very involved in the Steel Advisory Council, the Polymer Alliance Zone, and several other organizations, which you will hear about today. I think it's very important that we look at broad strategies for industrial development and see where different industry sectors can cooperate for the long term.

We've had an excellent year of success in industrial and economic development. Not only in the retention of jobs, but also the expansion. Many of the industries that are here today are expanding industries and we know that is very important. Our first presenter today is Dr. John Green.

Green: Thank you, John. The Aluminum Association represents 60 companies, with about 300 plants in 40 states. I have been involved all my time at the Association with the Industries of the Future (IOF) partnership with the DOE. It has been an interesting and a very rewarding exercise for our industry. I'd like to try, first to share some of the surprising or unexpected results that have come out of this process. The second thing I'd like to do is talk to you about another similar effort that is happening on a regional basis in the Pacific Northwest, giving you a glimpse of NATT, the Northwest Alliance for Transportation Technology. You could say it is competitive with what you're doing in West Virginia, but I think there are possible lessons to learn that might be beneficial.

I'll start off with the IOF partnership process that our industry, like the other six, has been involved in with the DOE. Our industry came at this from a very skeptical point of view. Initially, as Denise knows, there was a lot of concern, resistance, and questioning about if we really wanted to do it and what possible things we could get out of it. In a period of two years, I think that has really turned around enormously. Now, we see it as a very beneficial process for our industry on the national level. The industry has learned that cooperation is not only possible, but it is worthwhile. As you may know, our industry has had a rough time with anti-trust issues over the years. Twice the government has basically caused the industry to be reorganized. Therefore, there has always been a very deep-seated concern about involvement with the government. When we concluded the first workshop, which led to our completed roadmap, one or two of the representatives of the aluminum companies got totally

carried away and said, "This has been one of the most important historic milestones in the development of the aluminum industry." I'm not sure I could agree to that extent, but it certainly was a dawning on the various companies that cooperation made sense. Even our biggest members, the multi-national, fully-integrated companies, realized that they can't solve all problems themselves, and that it is worthwhile collaborating.

We're doing a next-generation roadmap exercise next week. We believe, as stated in our roadmap, that the highest priority item is for the industry to see if we can improve the technology related to electrodes in the reduction, smelting process. This involves possible advanced electrodes, specifically, cathodes, which conceivable could be wetted by the molten metal and be made part of something like titanium diboride or titanium carbide. As well as anodes, which hopefully will be made of materials which will last up to 10 years and have the possibility of creating oxygen as the off-gas rather than carbon dioxide. We are, in fact, proving to ourselves that the roadmap is a living, working document. It's not something that you put on the shelf. We're going to take this process to the next step and try to work more specific technology plans and details within the scope of the original roadmap. Our session is going to be a session on advanced electrodes with a specific emphasis on inert anodes. I'm delighted to hear that Century Aluminum of Ravenswood, West Virginia is going to join us at that session. Effectively, we're going to have all the smelter companies in this country working these plans.

A second thing that has come out of the overall roadmap is that the DOE stepped up to the plate and produced a profile of the industry. What we are seeing coming out of this process is that we are, in fact, creating educational tools. These are excellent tools, particularly this profile produced by the DOE. We love it because everyone is cynical these days and naturally discounts something that the industry says about itself. Taken together, the vision document, the roadmap document, many of the other messages, plus the profile document, are all educational tools that I would recommend to any university. What we are doing ourselves is following up with a very active program in trying to target certain universities and build recognized centers of excellence, and working further with institutions where there is an existing reputation in certain fields that are important to our industry. So, one thing that I think is coming out of this is that the industry has learned how to cooperate, which is no mean feat. The same thing probably applies to steel as well as aluminum. I think coming out of it, too, there is a focus for what should be done and what needs to be done. It's clear that some people in the past have looked at science for science's sake. I'm a strong proponent that we should do good science, and good technology — there's not much difference, in my humble opinion — to solve real critical problems to keep ourselves competitive in the global marketplace.

In summary, I think the industry has learned that because it is possible to have collaborative programs, it's no longer Century Aluminum versus Reynolds, or Alcoa versus Kaiser. It is, in fact, the aluminum industry on a global basis, or at least on a national basis taking on Pechiney, CRA-RTZ and the Pacific Rim. Or, it's the aluminum industry taking on the steel industry. It's a very tough, very vigorous competition, particularly focused on the automotive area which is an enormous market and challenge for us all. There are future large and extensive needs to improve our capabilities in the automotive area, particularly in regard to the Kyoto meeting ongoing at the moment. How do we make

our transportation system more efficient? We would really like to believe, as an industry, that we are part of this solution, and not part of the problem.

I'd like to turn now to the second thing, that is the Northwest Alliance for Transportation Technology (NATT). This is a group which has been spawned out of the Battelle Pacific Northwest Lab. What happened in the Northwest earlier this year was a very similar meeting to this. A gentleman called Gary McVey, who was the equivalent of Carl, convened about 140 people in the Seattle area. What they want to do there is develop a synergy between the local or regional industries in the Pacific Northwest. Somebody had a gleam in his eye to say it would be very important, given that it has been a traditional center for energy production, that a lot of the aluminum industry is located there, 40% in fact is located in the Pacific Northwest, that there is also magnesium and titanium production there, and recognizing that it is important for non-ferrous materials to be increased in the automotive area, to develop a sub-component or sub-assembly plant for automotive production in the Pacific Northwest. That's the long-term dream with which they have come up. In order to pursue that, they then attracted the PACCARs, the Freightliners and the truck trailer business. They attracted the aluminum industry and the energy producing industry. They invited Boeing. They got the local ship building group together. Everybody who was in the manufacturing of metallic systems came together. They have succeeded in having a line item in the budget. Last year they had \$2 ½ million associated with this. This year, I think it's gone up to about \$5 million. They've got tremendous support from Senator Slade Gordon, and there was a lot of political representation at this meeting. Secretary Peña made an excellent keynote address. What I think is happening there is that one plus one doesn't equal two, but one plus one equals three. The challenge for this group is to search for the synergy in what your collective industries do, see where the common features are, and then combine around those common threads. See if one can develop partnerships and activities with those common threads, and in that way build a common vision.

Well, that was what I wanted to say in sharing some thoughts about our roadmap experience and about what NATT is doing. If there are any comments or questions, I'd be happy to take them now or later.

Moderator: Thank you. Our next speaker is Brian Joseph.

Joseph: First, a little bit about what we do. If you look at our facility we have lots of equipment. I think there are five electron microscopes, mechanical testing laboratories, metallurgical labs, chemistry labs, industrial microbiology labs; it's very, very diverse in terms of the kinds of facilities we have. We also run all the quality control for the Ohio Coatings Corporation, which is a new state-of-the-art tin mill in eastern Ohio. We'll be doing their R&D as that kicks in. We have an SEM inside the plant that I'm going to talk about in a minute.

We set the lab up to do two primary things— very fast product development, very applied research and development, and to solve manufacturing problems. Today, we start one to two new projects a day, every day of the week, solving manufacturing problems from every industry that has been mentioned here and many other industries. For United Technologies you mentioned earlier we've qualified virtually all the materials that fly on the solid fuel rocket booster of the space shuttle. So we've tested adhesives, paints and o-rings. It all started after the Challenger accident and they came to us and

we helped them solve a lot of problems since then. For Wheeling-Pittsburgh Steel, being local, we've done some development projects. They have something called The System, which is a painted, galvanized steel product that you use to make all-metal buildings. It's the top-selling steel building in their marketplace. We worked with a couple other suppliers and developed that product about 2 1/2 years ago. It's really an interesting product because it's guaranteed to build an all-metal building that in 25 years will never chip, rust, or discolor. And, we develop things like stainless steel cut nails. That's kind of interesting, because Wheeling-Pitt used to own the world's largest cut-nail plant. I think it was built just after the Civil War. I'm not sure, but it's a very old plant. It makes a really good product, cut-nails. We helped them develop a stainless-steel cut nail used for making decks. They are really attractive, square-head nails.

For Century Aluminum, we've been developing brazing materials. Automobile radiators are made from brazing sheet, which consists of high-melting point aluminum in the center and low-melting point aluminum on the top and bottom, rolled together in a big coil. They take it and they stamp out the parts, hold them together, put them into a vacuum, heat them, and a radiator is formed in one step in an automotive plant. Recently, we've developed the next generation of brazing materials for Ravenswood, and it has just been qualified by a major automotive company. That will probably lead to some substantial sales in the next year or so. Perhaps \$25-30 million worth of substantial sales. We're pretty excited about that product.

Now, I want to talk a little bit about our work with 3M. For the last seven years or so, 3M has been our biggest customer. They are in the process of building the first real metal matrix composite plant in the US. I think this is really important. This is super-pure aluminum with ceramic fibers in it. These fibers are probably 10 times smaller than a human hair. They are very, very small. About half the volume of the material is ceramic and half is aluminum. It's 2 1/2 times stronger than steel. And, feel the weight of it. This is really significant, because no one has ever gone to market with something like this before. This is being done in West Virginia. Earlier, the idea was mentioned to take some of the materials that are being made here and make products from them locally. To me, this is the perfect material to make an absolutely unique industry in West Virginia.

This material not only conducts electricity, but it's a lot lighter than steel, and a lot stronger. So, you've got the strength advantage, weight advantage, and it's conductive, which means, you take a big cable, and it now becomes a little cable, reducing wind loading by ten times. You can make longer lengths than ever before. There are so many opportunities with this, and it's here. I expect this to be the next \$100 million business in West Virginia. While there has been well-over a billion dollars of federal money spent in composites, no one has been able to make a significant business out of it. I expect that 3M will be able to do that with this advanced technology. So, that's one we are real excited about. If you have any ideas, see Darren Rogers, sitting here in the third row. He's the one who is making this whole thing work. He's over-seeing that whole project for 3M Corporation.

The carbon foam that has been developed by the Carbon Products group at West Virginia University is something that Touchstone is really excited about. We hope to license that technology, take it to the market, and be making products out of the carbon foam on an everyday basis by the end of the summer. We have an aerospace company interested in parts. We think we know what it's

going to take to do that and we're very excited about that technology. It's another example of finding local technology and taking it to the marketplace.

We don't want Touchstone to get a lot larger in the location it's in, unless we start doing something substantially different. We think we're at a unique combination of size, equipment, and expertise to solve manufacturing problems. We do that really well. So, we're looking to build other laboratories and get into manufacturing of some advanced things. We're working with Tom Linder in the Polymer Alliance, looking at perhaps another laboratory down in the Polymer Alliance Zone. We hope to make a major announcement for something sort of big that I can't talk about right now.

I want to go over three things that I think are our biggest problems. The first one is vision. We sometimes see in West Virginia manufacturers a tremendous lack of vision. We were trying to attract the Byrd Center to our area, so I was calling around to the different machine shops in the area asking them if they would use a bunch of very sophisticated equipment that could help their business. I would get answers like, "Well, our business is down, but, if the coal industry ever stops, we might be interested in doing something different." That's a typical mid-size company response. We can't currently depend on them to expand and fulfill our needs for growth. I think there are things that WVU could do to impact the vision area. That's beyond what we can talk about now.

I see a tremendous lack of modern management practices in most companies. The world is changing. The new crop of people coming out of high school are different. They should be managed differently if you want to optimize what you do in your organization. That's another area I think WVU could also impact. By and large, universities haven't been good at doing that over the years. They tend to be very traditional in their approaches of teaching management.

The third one is this lack of an entrepreneurial environment. That's a hard thing to influence. I sat through a talk by George Gendron. He's the editor-in-chief of INC magazine. He's studying this issue of entrepreneurialism and when it starts. It appears that it starts about the second or third grade. It's not something he says you can influence in high school, and you can't influence it in the university. We've got to let the children know that it's a good thing to be entrepreneurial, to think, to be self-reliant. How many of you have ever talked to your children here about being an industrialist when they get older? That seems culturally so abnormal, so we don't have a lot of young industrialists starting big manufacturing operations. I think that is because we don't teach our children that is a good thing. The basic message they hear about big industry is that it is here to take advantage of us, it's sort of a negative thing. It's a place I'll work, maybe they will take care of me, maybe I can't trust them. There are a lot of messages we give, but owning it isn't one that we give them a lot. I think we need to give our kids that message. In fact, the old saying goes, "as you dream, so shall you become." We've got to have the kids dream the dream to become that thing that we want for our industry of the future. Thank you.

Moderator: Our final presenter on the program is Skip Lineberg.

Lineberg: Good morning. First, let me begin by fulfilling my obligation to John, and what I was asked to talk about. That is to give you a brief look at what's been done in these types of initiatives in the

past. Probably one of the first types of coalitions for economic development that was based on a commonality was Software Valley, which Governor Underwood helped create, back in the mid to late 1970's. Later the state, through legislative initiative, was empowered to create the Steel Advisory Committee, which was a group that was challenged to add value and to track industry that would promote the better utilization of our primary metal resources. Then, on into the 1980's there was a group that formed in the eastern panhandle region of our state called QUADCO. This is an economic development initiative that focuses on a road, I-81, which cuts through counties in four different states. So you had four different local governments, four different state governments, all working together to promote a region. Progressing on along the time line, the Polymer Alliance Zone (PAZ) was created last year by executive order. This is an example of the state promoting development of our polymer resources, to attract companies that better utilize the engineered polymer resins that are produced here in West Virginia. In 1997, the Council for Economic Development and Governor Underwood decided to appoint a council for Wood Technology, similar to the Polymer Alliance Zone, focusing on value-added wood products.

There are a couple omissions I've noticed in looking back and listening to this morning's remarks. Probably one of the most successful of examples of this type of development that I can think of is the Office of the Future Program which was developed by Bell Atlantic and others in industry and government. That program was created in the late 1980's, early 1990's to take advantage of our superior telecommunication infrastructure. If we look back over the last four years we can see where at least 16,000 jobs have been created, directly resulting from companies in telecommunication industries. So, there is an example where we've done a good job of taking a strength, a resource, getting the message out that here is something we have, and attracting companies that can take advantage of that.

Just as a side note, I thought it would be interesting for you to hear today that there are more than 7,000 economic development groups or organizations. Those 7,000 organizations or agencies currently offer over 50,000 financial incentives, low-interest loans, industrial development bonds, etc. They offer over 200,000 different forms of tax credits, so I don't think we're going to be successful, and we certainly don't do very well to differentiate ourselves, going out and saying to any Fortune 500 company, "come here because we've got the best incentive program in the land." Not only is that a "been there, done that" type of approach, it's also a very costly, very expensive to do, and probably not very good stewardship. Traditional economic development tended to be based on incentives, cheap labor force, and free land. Frankly, I think that is a worn out approach, and that there is a different strategy that is called for today. We need to look at our strengths such as natural resources, human resources, and information resources in order to differentiate ourselves from the other 7,000 groups out there.

Another thing, if we strategize and we figure what we want to be, and bring that leadership into play, then we attract industries within an economic cluster. Let's take the Polymer Alliance Zone for example. You might be thinking, "If I'm a plastics company, why would I want to recruit competitors to come into my labor market, making me pay more so that my employees won't jump ship and go to the next plastic company that comes along?" What I'd like you to think about is getting a little momentum behind this and integrating our educational system so that what we create is a place for

plastic or wood technology where people want to come to learn and want to stay after they have learned and worked in this industry. What you do is instead of putting a greater demand on that labor supply, you've actually increased the labor supply by getting new talent in through the schools.

Whatever you want to call this idea we've been talking about, the strategic coalitions, I think it's really the next generation of economic development. If you will, it's the Pentium of economic development. I'm excited about it. I've enjoyed working with the Polymer Alliance Zone and a couple of other initiatives of which John spoke. Thank you.

STRATEGIES FOR STRENGTHENING WEST VIRGINIA'S BASIC INDUSTRIES

Honorable Cecil H. Underwood

Governor of West Virginia

Introduced by Tom Burns, Executive Director, West Virginia Development Office

Thank you very much, Tom, for your generous introduction. It has been my good fortune to work with Tom on a number of projects over the years. As he mentioned, he was one of the original sponsors of Software Valley.

I appreciate the great work that Tom and the Development Office are doing. They are accelerating our efforts to market more aggressively because we are now in a worldwide competitive market. It's not a matter any longer of competing with another state, but it's competing with the rest of the world. We simply have to market better. But we have a lot more going in our favor now with which we can market than we ever did before.

Carl, it's a pleasure to work with you again. We've worked on a number of projects over the years, and Carl gives meticulous attention to detail. I noticed that he addressed his first comment to the glass industry, "The break is over!"

Dr. Mike Louis, thank you for hosting this meeting. Again, you do a great job in family medicine and related educational activities here in the valley. Your activities and those with which you're associated are so important to the growth of our future.

Senator Jackson, I appreciate the interest that you take in so many things in the Senate, particularly your leadership in the education field. I think you, perhaps better than any other member of the Legislature, understand the important relationship between education and future economic development.

We are honored to have Secretary Denise Swink with us. The program she's headed for the last several years is very important to the future of our state. My first speech following my election last year was at a meeting on Carbon Products at West Virginia University in Morgantown, sponsored by the same organization that you have here today. I was excited about the potential of what I heard then and I'm impressed that you've been able to move quickly into this important symposium. As I understand it, this is the first state-level Industries of the Future meeting in the nation, and I'm glad that West Virginia is being first in a positive, forward-looking program. Too often, we've been first in the nation in costly, no-growth activities, but that's all turning around, and everything is moving positively in the right direction now. The challenge we have in government, as well as the challenge you have in the private sector and private industry across the state, is how do we take the momentum we have, keep it going, and accelerate it everywhere we can?

We are enjoying an unusually good economic environment around the world and particularly across our country. We need to take advantage of those opportunities as rapidly as we can. I've talked a great deal about preparing ourselves as a state for the new times of the twenty-first century. As we plan and build for the economic opportunities of the future here together, we obviously cannot ignore the industries that have provided the backbone of our economic strength and heritage. Our challenge is, how do we adapt the basic industrial structure of this state to take advantage of all the new technologies and new approaches to economic growth that can be related to these basic industries?

I'm especially pleased that the Department of Energy has recognized the value of these traditional energy-intensive industries that will continue to play a vital and vibrant role in the future of our state. In the 1960's, the roof was falling in as the coal industry had taken its giant stride to full mechanization and 25% of the work force in this state had been displaced in little over a year. We were looking for every single opportunity to find new ways to get out of the problems that we suffered, as well as the economic pain that beset us, and for new ways to diversify our basic extractive industry economy.

We discovered then that the technology was present to convert coal to gas and liquid but they had not then, and still have not, found the economics of that process to make it competitive in the world energy market. We even explored the possibility of using the high heat of atomic energy to convert coal to gas. We felt that if this could be done economically, coal would have a greater value as a raw material for the chemical and synthetic material industry than perhaps it ever had as a fuel.

I've talked a great deal about technology, and I always have to make a disclaimer because I am not a technologist. I depend on my eleven-year-old grandson to get me out of trouble every time I go to the computer. I'm like Victor Borga was when he bought a chicken farm, his accountants said, "What do you know about breeding chickens?" And he said, "I don't know anything about it, I don't need to, they already know how to do that. What I need to know is how to make money off of what they already know how to do."

That's essentially our role in West Virginia; how do we use technology to help us expand, modernize, and direct the basic industries of our state toward future markets. What does it offer us in the way of new economic development, bringing new industries and new things to our state? No matter where technology is used, it's used for the same two purposes: to improve productivity and to control costs. And that applies no matter whether it's in government, private industry, education, or wherever.

As the global economy becomes more and more information intensive, I don't have to tell you that a commitment to technology will help West Virginia attract jobs in new information-related industries. Many of the 8,000 new jobs that we've announced this year have a firm relationship in that direction. We are already attracting these new jobs because we have a state-of-the-art telecommunication system already in place.

Bell Atlantic's \$20 million-plus commitment to West Virginia's 2001 program will help us compete even better. The 2001 program makes our state the first state in the nation to have this new broad-band telecommunications network available on a state-wide basis. Effectively, it widens the

information superhighway to allow voice data and video to flow more quickly and freely across the network. West Virginia 2001 follows on the heels of the World School Program, a joint venture over the last several years between Bell Atlantic and the schools of West Virginia. As a result of this cooperative approach, we have more schools in our state now linked to the Internet than any other state in the nation. We're trying and moving as rapidly as we can to make that a 100% linkage with the Internet, ahead of any other state.

We have, as you know, under Governor Caperton and the legislature's leadership over the last eight years, placed computers in grades K-12. In the future, when a student graduates from high school in this state, that student will have had thirteen years experience in the use of the computer and using a computer to learn new things, discover the excitement of new knowledge, and to apply it in whatever problem-solving that person needs to do.

The new ATM network will provide us with the state-of-the-art distance learning connections in the state that will tie everything together and provide us with an electronic proximity that we've never had before. As a result of that kind of proximity, we become one people—one West Virginia. We are all at the same table on an equal basis, and the state can do things that it never could do before because it will think more as one state. The mountains that so long separated us into isolated regions are no longer of such significance. Inter-city competition and county lines will disappear in their significance because the network crosses all of these boundaries and brings us together in one cohesive unit.

The same distance learning network that makes possible the linkage of every school in the state, every library, every college and university, also provides us a real asset for health care delivery. We are the second most rural state in the nation, and we have the highest average age population. This means that health care becomes an ever more challenging problem for us. How do we have a health care system that is accessible and affordable to people who live in remote areas of the state? MDTV is not something that's going to come in the future, it's already here. As this network is perfected, we'll be able to link together all of our medical schools and major medical centers, such as the one where we meet at this moment, with rural hospitals, community clinics, and home health care networks across the state.

Next week, Dr. Sam Tully and I are going to Idaho to participate in a ceremony that has real meaning to the future of our state. Next week we will make public a product, which originated in the United States Department of Justice and the technology for which was developed in Idaho. Lockheed Martin took the concept to its Idaho laboratory and has developed a "road spike" for the apprehension of run-away criminals who are a threat to life and safety on the highway.

When a police officer is alerted by radio contact of an escaping car coming down the highway, he throws the device across the highway. It reaches across two lanes, and turns up the road spike as the fleeing car approaches. These are hollow steel spikes that puncture the tire of the runaway car, causing the tires to go flat. No one's life is threatened because the officer controls it with a remote control. After the escape car passes, the road spikes are turned down and the following cars are not threatened in any way.

That road spike has six separate components. A prototype has been developed in the Lockheed Martin laboratories in Idaho, where we'll be next week. Six West Virginia small businesses, members of the Progressive Manufacturing Group, headquartered in Wheeling, are making those components for the road spike. They wouldn't have had a prayer of a chance to participate in that program by themselves, but by networking their resources and expertise, and through imaginative, creative leadership in progressive manufacturing, they are now participating in the worldwide market because every police officer in the world is a potential buyer for this product.

Unfortunately, Idaho is going to beat us to be the first state to purchase them. I'd hoped we could get through the Legislature and get that done here first. This is a great opportunity where technology provides something that was never here before. It doesn't replace any jobs, but it adds a tremendous potential for growth and excitement here in our state. We need to network everywhere we can; small businesses, large businesses, and in between. We need to sell our own state the products and services we produce here, as we develop our markets around the world.

We've already announced the location of a new technology in the southern coal fields, which seemed for so long to defy new technology. A new plant located in Gary, which was almost abandoned by the steel industry in the great coal mining era of the past, and a company financed by Australian capital has developed a new technology to remove the fine coal stored for so long in the storage ponds. After its initial cleaning, they run it through the new machinery that they have developed and produce coke briquettes for sale to the steel industry here and elsewhere. They will be employing 65 people at that one location. There are more than 250 such ponds around the state. Here's a new technology, not all that complicated, that can help us correct a historic environmental problem.

With the cooperation of the Legislature, we have revamped the Science and Technology Council, originally housed in the higher education offices with the chancellors. We have created a Technology Office within the Governor's Office to emphasize the use of technology in government itself, to help us take advantage of the opportunities of the age of technology and to do work with all of West Virginia's colleges and universities—public and private—utilizing the individual talents of faculty people across our state to help us discover new technologies through research. Each new technology brings a new product, a new service, or a combination of both which entrepreneurs then use to create new businesses. If it's successful, it will grow. That's the story of the West Virginia High Technology Consortium, a spin-off of Software Valley, building the future while using the heritage that we have from the past.

On the 23rd of October, I joined with a number of people to participate in a very significant event at Century Aluminum Company in Ravenswood, where Kaiser Aluminum Company produced its first coils of aluminum the same year I first became Governor in 1957. That company, now Century Aluminum, was facing a serious pollution problem a few years ago because its wastewater discharge was in the 100 year flood plane. I asked the environmental groups at West Virginia University and in state government to work with Century on the problem. Cooperatively, over a period of time, they developed a new state-of-the-art technology for handling the disposition of their discharge. As a result of that new state-of-the-art facility, which was dedicated on the 23rd of October, they now have a \$32

million dollar expansion underway. They are competitive where as they wouldn't have been without the new state-of-the-art wastewater treatment technology.

The Legislature this year very wisely reactivated the Steel Advisory Council and expanded its membership and its mission. We went there to see what can be done to encourage expansion of the steel industry, particularly in the northern part of the state. Furthermore, we are looking for new value-added uses of steel produced in West Virginia as part of the future of that industry. I was extremely pleased when I was present to break ground for a new building on the Weirton Campus of the West Virginia Northern Community College that is being wired to take advantage of the ATM network. They are working with the steel industry, particularly Weirton Steel, to develop new technologies and new training programs that can be used to train people for work in the future. As those programs are developed on site, they will be shared across the state and beyond, through the ATM network.

The glass industry has been important to our state for a long time, but on a diminishing scale of importance to the economy of the state because of its movement elsewhere, particularly overseas. Just two weeks ago we dedicated a new facility at Olgebay Park to promote a wide open market for the glass industry in the state. Not only major companies, but particularly small cottage industries, will be able to create new markets for their products and make sales through the new facility. And, of course, Tamarak is growing in its importance for the same purpose in southern West Virginia.

Many of you represent the chemical industry. We know full well that you are an important asset to West Virginia. You've contributed extensively to our economy. We also know that your industry has changed dramatically. It's a world wide industry now more than it has ever been before, and it is ready to make investments in the new technologies for the twenty-first century. Our facilities, for the most part, are old and many employees are growing toward retirement. It's extremely important that we, as a state, be able to compete successfully and effectively for new investments in the chemical industry that will carry us into the twenty-first century. We have created the Polymer Alliance Zone to promote and develop value-added uses for the chemicals manufactured in the state. The Polymer Alliance Zone has become very aggressive, very active in its marketing efforts already. We were delighted to be able to announce the location of DuPont's Herbicide Center at the Bell Plant again taking advantage of that new investment for the twenty-first century. We hope there will be many more new investments in West Virginia's chemical industry.

Forestry is important to our state and is our greatest natural resource because it is renewable. The forestry resources that we have, if they are properly and intelligently managed will be here for the indefinite future. They hold the greatest promise perhaps of any of our resources for the future. It's for that reason that I would like to see us take whatever steps are necessary to make the School of Forestry at West Virginia University the number one forestry research institution in the nation. I don't have anything against VPI, Tom, but I hear too many forestry people saying they are hiring more and more people from VPI.

We need to do everything we can to increase value-added manufacturing in the state and research new uses for wood products. We have proposed and are working to institute several wood products incubators around the state in connection the West Virginia Wood Technology Center in

Elkins and the Robert C. Byrd Hardwood Technology Center in Princeton. This is probably our greatest opportunity for growth and expansion in the value-added uses of the timber resources we have.

Last summer, Senator Rockefeller joined with me in a manufacturers' summit at the Greenbrier. We invited the CEO's of the major companies who operate in several states, including West Virginia, to come and spend two and a half days with us. We asked them to identify their experiences in West Virginia so we could approach working with them in a realistic partnership, both from the state and the federal level. They told us the things they liked, the things that were positive and also identified those areas that were problems for them, where we were at a disadvantage. We wanted to make sure that we were acquainted with their actual work place experience in West Virginia. I think they were surprised for two reasons. First, they were surprised that a Senator and a Governor would sit down for a whole day and listen, and secondly, that the Senator was a Democrat, and the Governor was a Republican. I think this gave good signals, and we plan to repeat this summit conference annually. We've already set the date for next summer, and those of you that represent those companies, I hope you'll be more than excited about encouraging your top leadership to come join us.

Workers Compensation, historically a problem in the state, didn't surface as a problem at the Greenbrier because they were all very happy with the reforms we had already initiated and were well under way. That does not say that there aren't still problems in Workers Compensation. We're very much aware of those, and we're working to try to bring them under control as rapidly as we can.

Two items that stood out as serious problems in West Virginia as compared to other states were the cost of new construction and health care costs. This afternoon, I'm meeting with Jim Bowen, the new president of AFL-CIO, to talk about the first one— how we can work with organized labor across the state, as well as with industry, to make sure that we retain the jobs we have and create new ones. We've already had a task force at work on health care costs. We know for example, that it's not hospital costs because our hospital costs are eighth from the bottom in the nation. But, West Virginia residents do have the number one use of emergency rooms in hospitals, which drives up the costs tremendously. We have asked the industries to help us with health care programs so their people don't have to use the emergency room at a disproportionate rate. We must control the rising costs of health care, and again, it will be by working together. We have been in touch with every health care provider in this state, and have not had anyone turn down my proposal to work together to find the answers to reducing costs in the future.

Governments can make two approaches to regulation. One, they can look for every opportunity to catch someone breaking a rule, fine them, and make an example. Alternatively, government can use its power of regulation and work with industries to discover problems and help to solve them. Two of the most exciting moments I've had this year were to award two OSHA National Safety Awards to two very hazardous industries in West Virginia. That happened because our Department of Labor went out to those sites and worked with every employee to make sure they were fully trained in state-of-the-art safety methods and to make sure they were in full compliance with all the OSHA regulations. Consequently, they had no accidents and they won an OSHA award. We are

trying to work with industry and business across the state to use the regulatory power of state government to identify any problems they may have and help them to solve those problems.

We are also trying to simplify permitting through the use of technology. We just announced yesterday the creation of a statewide e-mail facility to make it much simpler and easier to accomplish the permitting process in the state.

We have the West Virginia Alliance for Civil Justice, which is working cooperatively with all groups on the tort reform problems that face us in the state of West Virginia.

All of these things can be addressed, but if we don't have an adequate work force, we won't be able to take advantage of the growth potential that economic development brings us. We have combined the old JTPA program with the Vocational Council to form the Governor's Human Resource Investment Council. Again, we are trying to bring together every degree of every source of strength that is out there to train our people to work with all educational levels from kindergarten through the colleges and universities. This will help ensure a well-trained work force that will be able to meet the employment needs of the industries of the twenty-first century.

This is pretty much a shotgun approach of where I think we are today in West Virginia. I appreciate very much your willingness to participate in this two-day conference and to share with us in government ideas that you have from your perspective as to how we can advance our state into the future, how we can grow, how we can expand, and how we can enjoy West Virginia even more than we have at this time. Thank you.

SUMMARY, SYNERGIES, AND STRATEGIES FOR IOF-WV

Denise Swink

*Deputy Assistant Secretary for Industrial Technologies
U.S. Department of Energy*

It certainly is a pleasure to be here. Having listened to the wealth of information exchanged the past couple of days, I want to share with you a little bit of the history of Industries of the Future programs. I think there was a feeling of anxiousness in some of the work sessions, and I don't blame you for being anxious.

Back in 1992, the Office of Industrial Technologies was asked by the U.S. Congress, how do we know we are making the most important investments for the United States for cost share technology development with industry? The answer was, we didn't. So the question became, how do you go about finding out if you're making those right choices. We decided the key was that the government shouldn't be making those choices. We have been making the choices for 20 years and we had diminishing resources. So it was important to focus ourselves. We focused on the seven most energy and waste-intensive manufacturing industries.

The novel thing was rather than us deciding what was good for those seven industries now and in the future, we encouraged those seven industries to develop what they needed to be like in the future, and then tell us how to facilitate the resources for them to achieve that vision. I emphasize to you that it started in 1992. It is now 1997, which means we have been working hard on this for five years. It's come differently with different industries. It took the chemical industry two years to issue its vision. It took the steel industry about a year to develop its vision, and then about 18 months working on its road map. Aluminum took about two years to get the vision but within nine months I believe they had the first draft of a road map. It goes at a different pace depending on which group you're dealing with, but I want to share with you the importance of being patient. This is a very new environment for you all to be exchanging ideas and to be open with each other about what your needs and concerns are, so I really encourage you to be patient. If you're patient and put the time into it, the fruits are remarkable. I'm going to talk about those quickly and relate them to what we've been hearing—to show you that I was actually listening to what you were sharing with us the past couple of days.

First of all, I think it is so important to listen to your customers. You may have your day-to-day anxieties, but if you want to talk about where you're going to be 20 years from now, then you need to listen to your customers. Allow me to explain to you why in my experience that has been so important.

The metal casting industry, which is 3000 small foundries in the United States, is one of the partners in IOF. I had two meetings with 30 or so of the CEOs and presidents of that industry. They kept telling me, Denise, we're just going to keep incrementally improving over time. That's what we've done over the last 100 years, that's what were going to do for the next 100 years. I kept on telling them that I didn't believe they were going to be here 20 years from now if they kept operating that way.

Fortunately, by the third meeting an article by A.D. Little came across my desk. A.D. Little had a strategic planning session with the three big U.S. auto companies, Ford, Chrysler, and GM. Basically, it was to ask how people are going to order cars and what are your customers going to demand in the future. What the auto companies said was that by the year 2004, which is right around the corner, there may be no auto showrooms. They could see that people are going to order cars in a virtual reality environment. Instead of being asked which model they want, they're going to design the car they want! Now, what do you think that means for just-in-time delivery? What do you think that means to walking away from large inventories of generic products? As I communicated that story with the leaders of the metal casting industry, they saw how it would make a big difference in the way they do business. Auto companies are 40% of their market, and if they can't deliver to them, then the plastics folks or the aluminum companies or someone else certainly will. The metal casting folks decided that in their vision they really needed to reduce their lead time by at least one half. When they got to their roadmapping session, they looked at it again and thought about what the demands would be from the auto industry and from the aerospace industry. They decided that they had to do twice as good and that's what they charted out in their road maps.

So, it's very important not only to deal with what your day-to-day problems are, but to listen to what your customers are going to want 20 years from now. They will share it with you. I think it's absolutely key to be strategic and to set targets. It is critical if you are going to pull a mass of people together in a force to change the future. You have to be strategic, and you have to set targets that are measurable so that you know when you're making advances. You also have to be an active, willing participant in revisiting your vision and revisiting your road maps on a regular basis. The key to that is state leaders as you, Governor Underwood, and you, Tom Burns; university leaders, President Hardesty, Carl; and CEO's and presidents of companies are the ones who make these ultimate decisions on the future.

The portfolios of projects will continue to change as the industry groups continue to develop their technical road maps. But, what is important about it is that it is a portfolio of near, mid and long-term investments. I want to mention an example in the materials area.

Techtron Company has produced immersible tubes made with continuous fiber carbon composites developed through our materials program. The tubes were used in an aluminum melting furnace. The interesting thing is that because the material radiates the heat so efficiently, the gas consumption for that furnace went down 30 percent as soon as the burner was installed.

Then there are long term things. John has shared with you and I'm sure the aluminum group talked about new methods of making aluminum. We're investing in new inert anodes and new cathodes to eliminate production of CO₂ during aluminum production.

We have technical assistance programs, such as the Motor Challenge program. Alumax thought that they were going to have to make a large investment in variable speed drives. It's not the technology itself that was important, it was that they thought a major investment in their air handling system was necessary to reduce operating costs. We went in and helped them do an analysis of the performance and the efficiency of their existing fan system for air handling. Together, we discovered

that instead of having to invest in new equipment, their best option for performance, energy, environment, and economics was to shut down one fan on every pot line where they had four fans going. It improved the overall performance of the system and saved 25% of their energy right away.

So you can do a near-term thing, you can do a mid-term thing, and you can do long-term things, but what's key is that it's all charted on those visions and road maps. Because, if you start making investments today that aren't targeted at that long-term vision, you're wasting your resources. We've done that for too long, not only in the United States, but many of the places throughout the world. For each industry for which we create these portfolios, we regularly ask, "Is this on target, does it need to change, does it need some encouragement and help from organizations at the federal and state level?"

Hopefully, this is what you're going to get to, because that's really when the magic occurs. The magic occurs because once you have this, you know that you have the ability to bring more players to the table. When you clearly chart out what the long-term needs are, you become like AISI, which has all kinds of different companies proposing on their solicitation this year. Or, like the Aluminum Association, which has sent out hundreds of copies of the aluminum road map. Why? Because people can understand what you're trying to do. For example, in the forest products industry last year when they made the call against their road maps, they got 700 responses. Seven hundred responses of new ideas. So, it's a remarkable process; it provides a tremendous amount of synergy. I can give you examples for each one of the industries that were kind enough to come and share their ideas. There's so much going on in cogeneration, and sensors and controls, waste utilization, and heat recovery. The key here that I really encourage you to do is take the time to learn, take the time to listen, take the time to find out what's going on in other places, and chart your road map to the future. It will help tremendously in bringing people to the table.

This may not be astounding to you but it was astounding to me. When we did these assessments, we looked into the government wide programs that can potentially contribute to their road maps. For aluminum the potential contribution was some 23 programs at roughly four billion dollars. It was something enormous, and even if everyone of those programs can't help out, even if it's just a small portion of them, think of the difference that it will make for the industry.

And so what I want to do is this. I want to commit to you that we're here to help and encourage and get you connected. We have industries that come to us voluntarily asking us to help them through the visioning process. We are working with the Carbon Products Consortium in that way, to help the carbon industry do visioning and road mapping to interface as a cross-cutting industry with many other industries. Heat treating, welding, forging, and the titanium industry are others with which we were recently involved. So, we'll be more than happy to spend a tremendous amount of time and effort with you.

You really are a hallmark, as the first state that's taken this step to use what has been developed at the national level and make the most of it at the state level. Thank you very much.

THE GOVERNMENT'S ROLE IN INDUSTRIAL DEVELOPMENT

Panel Discussion

Participants: **Honorable Cecil Underwood**, Governor of West Virginia
Honorable Lloyd Jackson, West Virginia State Senator
Denise Swink, Deputy Assistant Secretary for Industrial Technologies, U.S.
Department of Energy
Tom Burns, Executive Director, West Virginia Department of Development
Sam Tully, Chief Technology Officer, Governor's Office

Moderator: **Carl Irwin**, WVU, National Research Center for Coal and Energy

Moderator: We really appreciate everyone being here. Yesterday afternoon we had breakout groups that were industry specific--aluminum, steel, glass, chemicals and wood products. They talked about technology needs from their particular industry's point of view. Later in the afternoon, we had five cross-cutting breakout groups, with all the industry sectors represented in each one. The purpose of this panel is to have key government officials address a few questions from the cross-cut breakout groups. The only panel members that haven't been introduced yet are Sam Tully and Senator Jackson. Sam, in a few words, tell us what you do.

Tully: In a few words, what the Governor tells me to do! Actually, the legislature passed a bill that constituted our office and provides for the planning, the use of technology in government, the procurement of different components of information systems for the government, and additionally provides, as the Governor mentioned, for the operation of the Science and Technology Council.

Moderator: Senator Jackson, you're known for your work with the education bill and the whole area of training, and worker preparedness. Is that one of your main areas of interest?

Jackson: My two main jobs in the senate are the Senate Education Committee, as well as chairing the Senate Subcommittee on Finance, which deals with the education component of our budget, which is about 70% of our state budget. In that capacity, I get to work with all these folks at this table. I'm also a member of the International School Board we created a few years ago to deal with our international students who are here visiting as residents in WV because of our international business programs.

Moderator: Thanks. Are there questions that the breakout groups would like this panel to address?

Joffe: There was a lot of interest in our group, and I believe in others as well, about education and training issues. Let me just frame it by telling the panel some of the concerns that were raised.

One is that people are not coming to the companies ready to be trained. Basic skill attainment for companies to build on is lacking. A second concern raised is that the technical training may be too specialized. People come to the company and without the flexibility needed to move from one skill to another. A third issue raised was the possibility of providing higher levels of training in the state vocational schools and the common interest in that from different companies. While that level of training may be available in the Charleston area, it may not be available elsewhere.

What is the state doing to respond to these types of needs, and what do you as public officials think that industry should be doing?

Jackson: I'll take the first shot. I'd like to give everybody a quick, maybe 30-second history lesson about education in America. I think it's really important that we bear in mind that we have a system in America that is in the throes of change. Public education was basically designed during the beginning of the industrial revolution to do what it does today. That is to take about 10-15% of our people and make them really high-level, high thinking, high-quality folks, and that's who is sitting in this room, and to get the other 85% literate and make them available to the mines, the mills, and the factories. As the Governor described in his speech, that time ended somewhere in the 60's and 70's. Unfortunately, our education system didn't make the change as quickly as it should have. The new demand is that every child that goes through our public school system should perform at high levels.

So, what you're going to see in West Virginia over the next few years is something that started a few years ago and culminated in a measure called Senate Bill 300. It's the setting of very high standards in our system, with I think reasonable assessments. It includes accountability measures to see that our students meet standards at the levels that are required in industry today. We believe in West Virginia that we have to do that.

Just today, Putnam County announced its establishment of core clusters and majors that students will be looking at next year. The goal is to get kids out of the general trap that we've had students in for so long. In American education, we've been preparing students too long for nothing. We're going to start preparing them for something. Not so specific that you can't train them, but specific enough so that they have the skills to be trainable when they get to the workplace.

You asked specifically, what can business and industry do? I'll tell you one thing they can do. They can stand up and be counted when the critics say that we don't need to do that. There are a lot of people in America today who will say, "Well, it was good enough for me when I went to school. Why are you changing everything? It must be good enough for my kids." The fact is, it's not good enough for their kids today. The world has changed, and we need to change our education system as well. We need the business community to stand and be counted when the time comes, and say that these changes are necessary. We have to have our kids performing at higher levels. We have to demand more of them in the classroom. They have to do more homework. They have to get better prepared for the job markets of the future. Taking a stand on these issues is certainly one thing that business and industry can do.

A second thing is that you can participate at the local school level. Not just with money, I'm not here to ask you for that. What we need is your active participation, to help teachers, faculty, and students understand what is demanded of them today so they will understand how important it is to perform at high levels in the classroom. Unfortunately, it was not required for many decades in this country, but it's required today, and students need to understand that.

Moderator: Sam, do you have anything to add to that along the technology lines?

Tully: Yes. Let me talk about this technology issue. A couple of weeks ago, Governor Underwood and I went to Battle Creek, Michigan to visit their Regional Manufacturing Technology Center (RMTC). It's an operating unit of Kellogg Community College. It is basically a "just-in-time" training facility for all the businesses in the Battle Creek area. Battle Creek, as you know, is the world headquarters for Kellogg. RMTC has totally modular training units available on a two-shift basis—on the spot. For example, if you have somebody who works for you that needs to learn how to use a micrometer, you can send them over to the RMTC. Your employee logs in and is given individualized instruction. They take a competency test when they are done, and you have the individual back in three hours. The RMTC sends you the bill for that particular competency training. It's also totally modular to the point that the student gets fractions of credit hours through Kellogg Community College so they can accumulate academic credit if they wish.

The operative point here is that the RMTC is heavily supported by the local businesses within a 50 mile radius of Battle Creek. The businesses go to Kellogg Community College and say, "I'm not here to give you criticism about what you are doing. I'm here to tell you very precisely what I need to have done. We're taxpayers, you guys use our tax money. Here are the requirements, here's what we need to have done." Kellogg Cereals actually has a time clock in that facility. They zip strip their employee identification card, and bang...they are at work, with training as part of their regular job. But, it's this idea that businesses are truly doing a two-way partnership. It's not the partnership of "you give us money and we'll do what you want us to do within reason if we can work it in...." It's much more of a "let us work with you to provide whatever your training needs are," and it's very successful.

Another related item is this issue of distance learning and telecommunications. The problem that we have in West Virginia is that we don't have large clusters of people in any one part of the state to the exclusion of the rest of the state. We have people scattered throughout the state. Traditionally, we have not had good ways of providing education for those people. It involves a bus ride, or, if you want to go to a community college, it involves a 50-mile round trip over the mountain, through bad weather and that sort of thing. Battle Creek has a network that links all high schools, vocational schools, and colleges within a two to three county area. So, in a sense, education is no further away than the local high school. That is where I think we need start getting. I agree with Senator Jackson that we need to raise the bar for academic advancement. We need to couple that with the ability to deliver instruction and training, wherever it is needed throughout the state on a fair and equitable basis.

Moderator: Anything to add to that, Governor Underwood?

Underwood: We don't have a Kellogg World Headquarters here, which is one of our problems. One reason we went to Battle Creek is that we are looking at how to create a more seamless educational system so that our youngsters from rural areas are exposed to the career opportunities of the world at a very young age. Then they can begin to think about what is out there that they might like to pursue. We want it to be possible for them to move in one direction and change direction without being penalized.

One thing, Sam, that you didn't mention is that the credits that are earned in the program at Battle Creek are acceptable at any institution across the state. There is no further bureaucratic decision, it's already done. We have a working model with Shepherd College and James Rumsey Institute, a vo-tech center in the eastern panhandle. We want to see if we can use that as a model to link our multi-county vocational schools, which are struggling with declining enrollment primarily because of the transportation problem, with our community colleges, not only to offer greater training for the young people, but re-training, and training for adults in this state as well.

One thing that Sam and I did when we were involved with the Vocational Council was to have employer groups look periodically at the school curriculum to see if it met their needs, if it was effective and what needed to be changed to meet the needs of the community. We need to be much more flexible, much more customer oriented. We just had a meeting with the vocational and community groups of the state. We need to have a more effective relationship there. We really don't have a community college system in this state. We have a junior college system used more to feed the four year schools than to do what a community college system should do. But, we have it, and we have to work with it in the best way possible, and we have to have a greater emphasis on flexibility. We don't want to say to a student when he or she comes, "we don't offer that course this year, you'll have to come back next year." The question ought to be, "what can we do for you, now?"

Moderator: Yes, Denise?

Swink: In some of the sessions that I was sitting in there was a concern that the university systems do not put out students who can relate to what happens on the shop floor. And, I would like to mention a couple of things. One, there is an Industrial Assessment Center at West Virginia University which the Department of Energy funds to do 25 audits a year of energy, waste, and productivity assessments for small businesses. The students are heavily involved in doing the audits, so the students get practical, shop-floor training. The results of the audits are put into an Internet database of over 6,000 such audits that have been done. On average, every audit results in \$40,000 worth of investment, which pays back in savings in less than two years. The students are prime candidates for hire by the industry. They are the kind of students that you want to hire as managers. There is also WVU's Energy Intern Program. Which is to do the next step, i.e., to go on site at the plant and do reports on how to carry out the recommendations that have been made. The experience that is available helps out tremendously with your concerns about college graduates being ready to move into the workforce.

Moderator: Tom?

Burns: I'd just like to comment that one thing companies are clearly telling us more and more often is that they can't find qualified employees. This is a serious problem that we need to deal with, and that's been reinforced by the discussion. But, it goes beyond that. What we call *vocational education* should really be changed to *technical education*. Vocational education is something that I grew up with, and that was yesterday. We need to aggressively meet the needs of tomorrow and provide technical education rather than focusing solely on training for a particular vocation. The other thing that I think is important is to look at it from a continuous education standpoint. Companies today need to have continuing education programs for their employees, in order to keep ahead of the technology changes. Only with that will we be able to keep up and in effect stay ahead.

Moderator: Good point. Charlie Sorrell. Does your group have something on a different topic?

Sorrell: Group B came up with two items. Actually, the Governor covered a large part of our first question in his speech, but let me bring it up again. Cost is a deterrent to getting industry to move to West Virginia, more specifically, construction cost, environmental cost, labor cost, health care cost and worker's compensation. What plans do you have to address these issues? Again, I recognize that the Governor addressed most of these issues.

The other might provoke a little discussion from the panel. The opinion was expressed that we should utilize government agencies to network with existing industries and ensure that we keep what we have, and then recruit other businesses. The thought behind that was that it is unlikely that the commodity industries that we're talking about this week will expand very much in the future. But what we should do is attract the manufacturers of high-value-added products—the end-products, and consumer products — so that instead of being simply a commodity supplier, you can get the economic benefits of value-added, downstream manufacturing.

Moderator: Anyone care to comment on that? Let's turn that last part into a question. How does West Virginia attract those manufacturers which use as input those commodities produced in the state?

Swink: I have a comment. I think one of the best ways that you can do that is to get them engaged in your roadmapping effort. Have the downstream manufacturing people come in, sit down, and talk about their expectations. If you roadmap out an industry that fulfills those expectations, you have much greater chances of them coming to co-locate with you.

Jackson: Let me comment from a strategic standpoint. Certainly, our primary focus is what can we do to help industries that are already here? What can we do to add value to what they do? What can we do to help them attract businesses that supply products to them or utilize their products? What can we do to help make them grow? These are questions that we deal with every day. Our retention representatives have the state broken down into six specific areas and they make visits. Many of you have been visited. Hopefully, the visits come up with lists of things we can do to be helpful from a state standpoint. Not that we solve all the problems, but we can relate to their problem and try to do the best job we can.

Another approach is to attract value-added manufacturing companies with which we have natural competitive advantages. Certainly, the timber industry is one that we're working on right now. We have a committee working on that and coming up with some excellent ideas on how we can be more effective in bringing value-added industry to West Virginia, and to utilize the wonderful resource we have. As the Governor mentioned, wood is our best resource because it's renewable. We currently have requests in this year's budget cycle to add a representative who will focus full-time in working with the wood products industry.

We do have other target industries as well at the current time. Certainly, technology is one on which we need to do a better job. We have another request for an expert in technology, to work with Sam's organization in tracking technology industries. But, we also respect the fact that we must deal effectively with industries already here, since 54% of the jobs added this year have been additions and expansions of existing companies.

Moderator: Ok, we're going to have time for one more question. Bill Rainey, a question from Group C, please.

Rainey: Governor, Senator, we had a lot of discussion on our panel about the waste stream. Not only about solid waste, but also waste water. Questions were raised about how to best partner with the communities, state and local government and industries to perhaps create wastewater treatment facilities. How do we get an overall comprehensive solid waste plan that will cover not only the waste that comes from industrial facilities such as those represented in this room, but also for residential waste. That overall issue was discussed as to whether there is a way to bring it all together. Whether that would be legislatively, administratively or otherwise.

Underwood: We are trying first of all to eliminate as much waste in government as we can without creating a pollution problem. Specifically, I have initiated an effort with the Governors of the other extractive states to try to loosen or let us spend some of the money that is available for unreclaimed, abandoned mines around the state. There is a whole reserve in Washington that is not being used. If we could apply that, I think technology offers us a great potential, as I suggested in the case of the Gary project. But, waste becomes a greater and greater problem because of the growth of our people. We don't want to offer our services to deal with everyone else's waste, but we certainly have to deal with our own. It's not an easy problem. Again, I think it requires the cooperation of industry and government working together.

Jackson: You know, Bill, it's certainly not my area of expertise. In the Legislature we're often called to vote on these particular subjects. All of you remember the battle we fought eight years ago over solid waste, particularly as it relates to out of state waste in West Virginia. The courts have now pretty well dealt with that issue, but not so positively for our state, in some regards. I suspect the Legislature will revisit that again this year or next. We probably should consider that some of the tipping fees and things we've been charging, which get pretty high in West Virginia, are going to have to be directed towards the development of facilities to deal with waste in West Virginia. We must direct that money towards bringing jobs to West Virginia. Certainly controlling waste is becoming a big issue all across this state, both in water resources and in terms of solid waste. I think that we're going to have to revisit

that whole issue on solid waste anyway. It would probably be good if the industries at this table would push for a special call to deal with the waste problems we have. I think we're going to take it up anyway to help bring more jobs to West Virginia.

Moderator: Thanks to everyone for your interest and especially to the panel for addressing these questions.

CONCLUSIONS AND CHALLENGES FOR THE FUTURE

The symposium had excellent participation by leaders from West Virginia industry, state and federal government, and higher education, demonstrating the substantial cooperation, goodwill and capability which exists for continually improving the State's economy.

The IOF-WV industry sector breakout groups were successful in developing over 120 technical project ideas, while the cross-cut breakout groups found some 55 critical issues of concern to IOF-WV companies and over 30 strategy recommendations for enhancing growth and global competitiveness of West Virginia companies.

There are seven immediate challenges for the IOF-WV program:

1. **Develop funded R&D projects for IOF-WV research teams.** The industry sector Working Groups should prepare and submit proposals reflecting the R&D needs established at this Symposium. West Virginia industry leaders have been very cooperative in helping initiate IOF-WV, and their continued participation in developing proposals and obtaining beneficial results will be essential to future success.
2. **"Institutionalize" the relationship of IOF-WV with WVU, the WVDO, the WV Science and Technology Council, the WV State Legislature, and the Governor's Office.** IOF-WV can help further the common interests of these organizations in areas such as creating and preserving jobs, transferring and implementing new technologies, funding for research, and attracting new companies to the state.
3. **Work closely with the national-level IOF program.** The state-level effort needs to be well informed about industry Visions and Technology Roadmaps which are developed in the OIT's national-level IOF program. At the same time, state-level needs and priorities for improved productivity should be recognized by the DOE.
4. **Mobilize interdisciplinary teams around important cross-cutting issues identified at the Symposium.** IOF-WV participants can help address concerns such as availability of a quality workforce, environmental restrictions, and use of byproducts and waste materials as feedstocks for other industries.
5. **Build vertically integrated partnerships to enhance productivity and competitiveness of West Virginia's basic industries.** The emerging high technology industry in West Virginia can team with coal, natural gas and power generation companies, as well as others, to improve the efficiency and productivity of basic manufacturing companies.
6. **Cooperate with the WV Development Office and other groups in their efforts to attract new business to the State.** A strategy suggested by the cross-cut groups at the 1997 Symposium is to attract manufacturing companies which use as input the intermediate materials

- aluminum, steel, glass, chemicals, and wood products - currently produced in West Virginia. Most all agreed that production of commodity materials is not likely to expand in the state, but manufacture of finished, consumer products should, by all means, expand. For example, the Chemical industry advocates increased manufacturing of high-value downstream products which have a natural link with West Virginia, such as outdoor recreational equipment.

7. **Hold a Second Annual IOF-WV Symposium in December 1998.** The second Symposium would have Expo style exhibits for the Working Groups to show projects, products, and partnerships relevant to IOF-WV goals. The exhibits would be inclusive of a variety of R&D and technical assistance projects, independent of funding source. A Signing Ceremony will be held where stakeholder organizations such as WVU, the WV Science and Technology Council, the WV Legislature, the Governor's Office, the U.S. DOT/OIT, and others can sign onto a statement indicating their support of IOF-WV programs— related to challenge 2 above.

Thank you very much for your interest in the IOF-WV program. If you have comments, questions or suggestions please contact any member of the West Virginia University IOF-WV team.



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IOF-WV SYMPOSIUM AGENDA

Monday, December 1, 1997

Preliminary Work Sessions

1:00 **Welcome to WVU Health Sciences Center - Charleston**
Michael Lewis, Vice President

- 1:10 The National-Level IOF program**
Kurt Sisson, Associate Director, U.S. DOE Office of Industrial Technologies
- 1:30 Work Groups and Chairs: Session I**
- | | |
|----------------------|-------------------------|
| Aluminum | Richard Love |
| Steel | Tom Danjczek |
| Glass | Beri Fox and Tom Fenton |
| Chemicals | Bill Forrester |
| Wood/Forest Products | Lanny Williamson |
- 3:15 Break**
- 3:30 Work Groups and Chairs: Session II**
- | | |
|---------|-----------------|
| Group A | Paul Joffe |
| Group B | Charles Sorrell |
| Group C | Bill Raney |
| Group D | David Lowe |
| Group E | Roger Duckworth |
- 5:30 Summary of Proposed EPA NOx emission standards**
John Johnson, Chief, Office of Air Quality, WV DEP
- 5:30 Reception for attendees**
Sponsored by the Carbon Products Consortium
- 7:00 Dinner**
Dr. John Carrier, President, WVUIT
Dr. Charles Manning, Chancellor, University of West Virginia Systems
- Steel Industry IOF Programs**
Larry Kavanagh, Vice President for Technology, American Iron and Steel Institute
- 8:30 Further discussion and socializing**

Tuesday, December 2, 1997

- 7:30 Continental Breakfast**
- 8:20 Welcome to the WVU Health Sciences Center - Charleston**
Michael Lewis, Vice President
- 8:30 Introduction to the Symposium**
David C. Hardesty Jr., President, WVU
- 9:00 Panel report on results of Preliminary Work Session I**
Chaired by James Jacobs, Plant Manufacturing Manager, Corning Consumer Products Company
- 10:00 Break**
- 10:15 Panel report on results of Preliminary Work Session II**
Chaired by Phylliss Cole, Deputy Assistant for Internal Governmental Affairs, Office of the Governor
- 11:15 Panel discussion on strategies for industrial development in WV**
John Snider, WVDO, Chair; John Green, The Aluminum Association; Brian Joseph, Touchstone Labs; Skip Lineberg, WVDO
- 12:15 Lunch**
- 1:15 Strategies for Strengthening West Virginia's Basic Industries**
Cecil H. Underwood, Governor
- 1:45 Summary, Synergies, and Strategies**
Denise Swink, Deputy Assistant Secretary for Industrial Technologies, U.S. DOE
- 2:15 Open discussion**
Governor Underwood; Denise Swink, Tom Burns, Director, WVDO; Sam Tully, Chief Technology Officer; WV Senator Lloyd Jackson
- 3:00 Break**
- 3:15 Wrap up discussion and plans for the future**
- 4:00 Adjourn the Symposium**

AGENDA FOR BREAKOUT WORK GROUPS - SESSION I

Monday, December 1, 1997

The objective of Session I is for each of the five IOF-WV industry sectors to develop descriptions of four to six high priority R&D project topics and corresponding R&D teams. Each recommended R&D project should be judged to be of real value for enhanced productivity of IOF-WV companies. Some of the recommended topics should fall within the scope of existing DOE/OIT/IOF industry visions and technology roadmaps. The results of the breakout groups will be reported during the 9:00 panel session on Tuesday morning, December 2.

- 1:30 to 1:40** Introductions around the room and brief discussion on understanding the objective for the session.
- 1:40 to 1:50** Short presentation by OIT Industry Team Leader on existing funding opportunities, solicitation dates, program priorities, etc.
- 1:50 to 2:30** Brainstorming period to develop a list of specific projects to increase productivity and reduce costs for West Virginia companies through improved energy efficiency, reduced waste material, use of new technologies, better inventory and management systems, etc.
- 2:30 to 3:00** Determine the four to six top priority projects to benefit WV industry. Briefly describe each project and potential interdisciplinary R&D team. These projects will be presented in the 9:00 panel on Tuesday morning.
- 3:00 to 3:15** Make plans for future actions by the group to pursue existing opportunities and develop new ones, e.g., select a steering committee, collaborate on a proposal, etc. Plans for future actions will be discussed during the Wrap-Up Discussion at 3:15 on Tuesday afternoon.

Co-chairs for breakout groups in Work Session I

- Aluminum:** Richard Love, Century Aluminum Corp.; Hank Kenchington, OIT
John Zondlo and Muhammad Choudhry, WVU
- Steel:** Tom Danjczek, Tom Danjczek, Steel Manufacturers Association.; Scott Richlen, OIT
Ken-Minn Chang and Bob Creese, WVU
- Glass:** Beri Fox, Marble King, Inc.; Tom Fenton, Fenton Art Glass; Theo Johnson, OIT, Ed
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- Chemicals:** Bill Forrester, Bayer Corp; Doug Faulkner, OIT; Bruce Cranford, OIT
Gene Cilento, WVU, and Garth Thomas, WVUIT

Wood: Lanny Williamson, Williamson Pallets, Inc.; Ingrid Watson, OIT
Tim Pahl and Larry Banta, WVU

AGENDA FOR BREAKOUT WORK GROUPS - SESSION II

The objectives of Session II are for each breakout group to (1) define eight to ten of the most critical cross-cutting issues facing manufacturing industries in West Virginia; (See examples on next page;) (2) discuss and suggest strategies for developing new manufacturing industries in West Virginia. (See examples on next page.) The results of the breakout groups will be reported in the 10:15 panel session on Tuesday morning, December 2.

- 3:30 to 3:40** Introductions around the table and brief discussion on understanding the objectives for the session.
- 3:40 to 4:15** Brainstorm period to develop a list of the most critical cross-cutting issues facing manufacturing industries in West Virginia. The main focus should be on those issues which have technology-based solutions.
- 4:15 to 4:30** Determine the eight to ten most critical issues.
- 4:30 to 5:00** Brainstorm period to discuss, identify and recommend strategies for enhancing manufacturing industries in West Virginia..
- 5:00 to 5:15** Summarize results of the session for presentation in the 10:15 panel on Tuesday morning. Prepare two to three questions for the Open Discussion at 2:15 on Tuesday afternoon.

Co-chairs for breakout groups in Work Sessions II:

- Group A:** Paul Joffe, Wiley, Rein and Fielding
Garth Thomas, WVUIT, and John Zondlo, WVU
- Group B:** Charles Sorrell, U.S. DOE Office of Industrial Technologies
Bob Creese and B. Gopalakrishnan, WVU
- Group C:** Bill Raney, West Virginia Coal Association
Larry Banta and Muhammad Choudhry, WVU
- Group D:** David Lowe, Charles Ryan and Associates
Keh-Min Chang and Gene Cilento, WVU
- Group E:** Roger Duckworth, WV High Technology Consortium Foundation
Tim Pahl and Ed Sneckenberger, WVU

EXAMPLES OF TOPICS OF CROSS-CUTTING INTEREST TO IOF-WV COMPANIES

- Impacts of restructuring and deregulation in the electricity industry
- Cost of coal, natural gas, and electricity
- Advanced materials
- Environmental issues
- Information/communication technologies
- Computer/software technologies
- Sensors and controls
- Worker training issues
- Business climate issues
- Interdisciplinary project teams
- Funding for interdisciplinary projects
- Exporting

EXAMPLES OF STRATEGIES FOR ENHANCING AND GROWING MANUFACTURING IN WEST VIRGINIA

- Go after companies which use the intermediate materials - aluminum, steel, glass, chemicals, and wood products - currently made in WV.
- Put together vertically integrated industry R&D partnerships to help keep IOF-WV companies globally competitive, i.e., resource extraction and power generation companies through high tech computer/information companies work to increase efficiency and productivity of basic industries.
- Use modern communications technologies to directly link WV's manufacturing companies to customers in all parts of the world for immediate customized orders, customer service, etc.
- Promote companies which manufacture products for West Virginia-related activities such as hunting, whitewater, camping, mountain biking, etc.
- Seek foreign investment in the state to facilitate the above strategies.