Industries of the Future-West Virginia
Resources...Innovation...Results
promoting long-term industrial partnerships

Proceedings
IOF-WV Symposium 1998

West Virginia University
National Research Center for Coal & Energy
December 9 & 10, 1998

Co-Sponsors

U.S. Department of Energy
Office of Industrial Technologies

West Virginia Development Office

West Virginia University

PREFACE

The WVU National Research Center for Coal and Energy hosted the second IOF-WV Symposium in Morgantown. The meeting documented progress made by the six IOF-WV industry working groups since the 1997 Symposium and included the organizational meeting of an IOF-WV mining industry working group. Another purpose of the Symposium was to facilitate and focus on implementing projects and proposal ideas that have evolved from IOF-WV industry groups over the past year.

The U.S. DOE Office of Industrial Technologies (OIT) initiated the national IOF program in 1992 and for the past two years has strongly encouraged individual states to launch state IOF programs. Jim Quinn, head of the states-IOF team at OIT, notes in his Symposium presentation that more than 20 states are now in various stages of developing IOF programs.

These proceedings contain stories of traditional West Virginia industries that Governor Underwood describes as the "backbone of our economic strength and heritage." Our IOF-WV companies find themselves in the midst of a rapidly changing economy. Senator Rockefeller sincerely and eloquently expresses both his fear and excitement for traditional West Virginia industries as we move into the high-tech, global Internet economy of the future.

Denise Swink, Deputy Assistant Secretary for Industrial Technologies, encourages West Virginia's traditional industries to be on the forefront of the new economy by embracing the newest developments in information technologies, advanced materials, and process optimization. Opportunities for such improvements through the OIT and other DOE programs, as well as the Department of Commerce, were discussed at the Symposium.

The West Virginia Development Office is a crucial link from research and demonstration projects to company locations and jobs in West Virginia. At least 12 members of the WVDO participated in the Symposium, and presentations by Tom Burns, John Snider, and Jeff Herholdt are included in these proceedings.

Other industry organizations such as the West Virginia Manufacturers Association, the West Virginia High Technology Consortium Foundation, the Polymer Alliance Zone, the West Virginia Steel Advisory Commission, the Society for Glass Science and Practices, and the West Virginia Forestry Association took part in the Symposium and are dedicated to the long-term viability of IOF-WV companies.

Thank you for your involvement in IOF-WV, and we look forward to seeing you at the 1999 Symposium.

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IOF-WV SYMPOSIUM AGENDA

Tuesday, December 8, 1998

7:00 p.m. **Reception, Registration, Posters, and Exhibits**

Wednesday, December 9, 1998

7:30 a.m. **Continental Breakfast, Registration, Posters, and Exhibits**

8:00 **Welcome to the Symposium**
WVU President David Hardesty

8:15 **Accomplishments, Opportunities, and Challenges**

Review of the Past Year
Carl Irwin, Jeff Herholdt, Jim Quinn

Industry Panel
Ric Love, Cenury Aluminum; Beri Fox, Marble King; Brian Joseph, Touchstone Research; Paul Bryan, Union Carbide

9:45 **Open Discussion**

10:00 **Breakout Sessions for Aluminum, Steel, Metal Casting, Glass, Chemicals/Polymers, and Wood/Forest Products**

12:00 **Working Lunch**

12:30 **Summary Reports from Breakout Sessions**

1:30 **West Virginia Industry in 2020: A Federal View**
Senator Jay Rockefeller

Federal Panel
Denise Swink, Deputy Assistant Secretary for Industrial Technologies, U.S. DOE;
Dr. Leslie Smith, Director, Material Science and Engineering, NIST

3:00 **Break**

3:15 **Signing of Carbon Foam Licensing Agreement: WVU and Touchstone Research Laboratories**

3:30 **West Virginia Industry in 2020: A State View**
Governor Cecil H. Underwood

State Panel
Senator Mike Oliverio; Karen Price, WVMA; John Snider, WVDO

5:00 **Open Discussion**

5:30 **Reception and Dinner in Erickson Alumni Center**

6:15 **Symposium Dinner/IOF-WV Recognitions**

Dumping, Global Competitiveness and IOF-WV
Paul L. Joffe, Wiley, Rein & Fielding, Washington, DC

Thursday, December 10, 1998

7:30 a.m. **Continental Breakfast**

8:00-2:00 **Optional Short Courses and Work Sessions**

8:00-9:30 **A-1 Lean Manufacturing**
B-1 Strategies for Benefiting from a Competitive Electric Market
C-1 Tutorial on Writing NICE^3 Proposals

10:00-11:30 **A-2 Financing Process Improvements through Performance Contracting**
B-2 Energy, Waste, and Productivity Enhancements that Reduce Manufacturing Costs for IOF-WV Companies
C-2 Organizational Meeting of WV Mining Industry Group

11:45 **Lunch**

12:30-2:00 **A-3 Recent Trends in Scheduling**

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Paul Bryan
Union Carbide

ACCOMPLISHMENTS, OPPORTUNITIES AND CHALLENGES

Highlights of IOF-WV accomplishments over the past year: *Carl Irwin*

Aluminum Industry

Century Aluminum became a participant in a $2.2 million award through the national IOF Aluminum program.

Steel Industry

A WVU research team is working with Weirton Steel, Wheeling Nisshin, and ORNL on a project to study corrosion of roller bearings in continuous galvanizing lines. During 1998, a WVU engineering professor assisted Weirton with preparation of two NICE^3 proposals. The Steel Advisory Commission and the IOF-WV Steel Industry Group are working with universities, industrial companies and government agencies on joint projects, programs and meetings.

Glass Industry

With seed funding of $5,000 from the state, the Glass Industry group has received a commitment of $50K from the OIT Glass Program to pursue work on the crack-off problem. A research team of Fenton Glass, Pilgrim Glass, FETC, and WVU submitted a winning proposal to the 1998 Glass Lab Call on the use of CO_2 lasers to eliminate waste from "crack-off" of blown glass articles.

Chemical/Polymer Industry

A WVU research team and the Polymer Alliance Zone are teaming with D.N. American of Fairmont and MBA Polymers of California on a $1.5 million project to develop and demonstrate technologies for recycling of end-of-life electronics.

Wood/Forest Products Industry

The thin-kerf blade project received $15,000 in state funds and a commitment of $80K from the OIT Advanced Materials Program. Building on an energy assessment sponsored by the West Virginia Development Office, a WVU senior design project is studying new designs for air/dust handling systems at Bruce Hardwoods.

Metal Casting/Foundry Industry

This is the newest industry sector to participate in IOF-WV. They held two working group meetings prior to the symposium to start discussion on R&D needs.

Cross-Cut Technologies

The **WVU Electric Industry Research Group (EIRG)** is studying industrial use of electricity, distributed generation, impacts of deregulation, and strategies for companies to benefit from restructuring of the electricity industry. This group has a commitment of $50K from the OIT Cross-Cut Technology program to match state funding of $70K. A WVU engineering professor with the EIRG spent several weeks this past summer visiting IOF-WV companies to develop electricity efficiency strategies for industry.

As part of the national IOF program on crosscut industries, the **Carbon Products Consortium** prepared and recently presented *The Carbon Products Industry Vision for the Future* to the OIT.

The **WVU Industrial Assessment Center** has conducted hundreds of energy and waste assessments for small and medium-sized companies in and around West Virginia.

The **WV Manufacturing Extension Partnership** has a network of industrial extension agents around the state who assist small companies in addressing management and production problems.

The **Projects with Industry Program at WVU and WVUIT** identifies and conducts technical-assistance projects for WV companies on energy, process efficiency and environmental issues.

Role of IOF-WV in the West Virginia Energy Efficiency Program: *Jeff Herholdt*

Industries of the Future – West Virginia

- Broadens the scope of our technical-assistance efforts.
- Provides our industries with access to Office of Industrial Technologies Resources.
- Establishes an industry-driven focus for the technical-assistance programs administered through the Energy Efficiency Program.

West Virginia Development Office technical-assistance efforts typically involve a semester analysis by senior level engineering students and/or faculty.

- Student energy intern program (WVU/WVUIT)
  - 15 projects per year
- Glass industry assistance program
  - 3 projects per year
- Wood industry assistance program
  - 6 projects per year

The West Virginia Development Office sponsored on-site technical assistance projects in 1998 at the following West Virginia companies:

ANKO Nobel Chemicals
B.A. Mullican
Babcock Lumber
Beckwith Lumber
Brooke Glass
Bruce Hardwoods
Clearon
Danser Inc.
Elkem Metals
Georgia Pacific
H.K. Castings
Leslie Brothers Lumber
Lyondell Chemical
Marble King
92 Wood Products
Northrup Grumman
PACE Tec
Paul Wismach Glass
PPG Industries
Praxair
Savin Lumber
Smith Construction
Steel of West Virginia
Union Carbide
Walker Systems

On-site projects are consistent with the IOF-WV industry sector priorities.

Projects involve plant modernization – the evaluation and design of the new technologies.

- Oxy-fired glass furnaces
- Computer-generated lumber yield analysis
- Materials recovery and reuse
- Design of overhead crane applications
- Accelerated die change-out procedures
- Improved work environments

Industrial participants use these programs to:

- Analyze the appropriateness of new technologies
- Reduce operational costs/improve environmental performance
- Provide design assistance on long-term projects
- Identify new potential employees

Role of state IOF programs in the national IOF program: *Jim Quinn*

The Office of Industrial Technologies (OIT), part of the Department of Energy's Office of Energy Efficiency and Renewable Energy, provides a broad array of products and services to industrial customers, from the shop floor, to research and development laboratories to the executive suite. It delivers a portfolio of productivity-enhancing products, services, and emerging technologies tailored to its customers' needs. OIT is encouraging industry-wide efforts to boost productivity through a strategy called Industries of the Future (IOF). The IOF strategy focuses on nine energy- and resource-intensive industries: agriculture, aluminum, chemicals, forest products, glass, mining, metalcasting, petroleum refining, and steel. These energy-intensive industries account for over 75 percent of the energy consumed by U.S. manufacturing. They face significant challenges in remaining globally competitive and environmentally acceptable into the 21st century.

The generic process, which OIT and industry have used successfully since 1994, begins with the creation of a vision for the future. The vision sets long-term goals and serves as the basis for partnerships between industry, government, and other key players. The next step – an industry roadmap – represents the critical link between the broadly defined strategic goals contained in the vision and a detailed research portfolio that will be pursued through industry/government partnerships and other mechanisms.

In 1997, OIT initiated a pilot project with West Virginia to implement Industries of the Future on a state level. Owing to the rapid success in organizing a West Virginia industry program, State Industries of the Future was offered as a State Energy Program-Special Projects alternative in FY 1998, and 16 state grantees (plus five additional state partners) initiated activities for State-IOF.

OIT hopes to establish state-oriented Industries of the Future in all states and regions where there is substantial economic activity in one or more Industries of the Future. The goals of these state-level activities are to increase awareness of the Industries of the Future processes and products in state government, to build alliances with industries within states,

and to establish customer-oriented activities which can help state industries become more productive and efficient in the use of energy and other resources.

A wide variety of tools is available to assist states in initiating and supporting state Industries of the Future activities. These tools can be found on the Office of Industrial Technologies website, http://www.oit.doe.gov/, or can be ordered from OIT's Resource Room at (202) 586-2090.

State Industries of the Future provide important opportunities to assist state economic growth and long-term industrial development. Energy-intensive Industries of the Future are particularly beneficial to states as they often pay high wages, have a multiplier effect by supporting ancillary supplier industries and infrastructure, and by their capital intensiveness are more committed to staying in the state than most light industries. States such as West Virginia, are embracing a States Industries of the Future strategy and are showing positive results. There are many lessons learned from states' ongoing work which may be widely applicable in similar efforts. Communicating experiences and collaborating within states and among states can contribute to successful prosecution of these state efforts.

INDUSTRY PANEL: *Ric Love, Beri Fox, Brian Joseph, Paul Bryan, Union Carbide*

Larry Banta:
The people you see at the table on my left have been involved with IOF either in West Virginia or nationally or both since the beginning of the state program. As Jim Quinn said, West Virginia has been out in the lead in trying to develop a state-level IOF program. It's something that is viewed as a good idea and is spreading nationally. The truth is that we're inventing this as we go along. We are very open to how this program should be molded and shaped in the future. What these people have done is to use the resources that are available through this program and through various other state and federal programs to impact their own businesses. I invite you to listen to what these people have to say and look for ways to benefit your company while helping to shape the future of IOF-WV.

(Owing to a breakdown in the tape recording system, transcripts of Ric Love, Beri Fox, Brian Joseph and Paul Bryan are not available. Brief summaries of comments from each speaker follow.)

Ric Love and **Beri Fox** represent, respectively, large and small West Virginia manufacturing companies that, through IOF-WV, have become aware of opportunities and resources of significant benefit to their businesses. **Brian Joseph** is co-founder and president of **Touchstone Research Laboratories** located in Triadelphia, WV and **Paul Bryan** is currently with the **Union Carbide South Charleston Technical Center**. Prior to joining Union Carbide, Paul participated in the Chemical Industry IOF Technical Roadmapping process.

Through IOF-WV, **Ric Love** reported that **Century Aluminum** became more active in the American Aluminum Association and teamed with three partners on a proposal to the national IOF Aluminum program. The proposal was selected for funding and will develop

new additives for pot liner materials, which will lead to more efficient operation of the reduction process at Century Aluminum.

Beri Fox of **Marble King** shared her personal sense of excitement, challenge, and optimism which the IOF-WV program has brought to the West Virginia hand-glass industry. For example, the Society of Glass Science and Practices has incorporated IOF-WV issues into their Board meeting agendas and has given the IOF-WV program prominent roles in the SGSP annual conference at Oglebay Park. Marble King benefited greatly from discussions on increased refractory life during at the 1st IOF-WV Symposium in Charleston.

Brian Joseph discussed the applied shop floor R&D that **Touchstone Research Lab** does for many West Virginia companies, large and small. Touchstone also teams with universities and government agencies to write proposals and to conduct funded research. They find that companies increasingly expect quick turnaround on R&D, which must be focused on specific meaningful results. Rapidly changing technologies and increased competitiveness force companies constantly to become more energy-efficient, to produce less waste, and to implement, if not develop, new processes and materials. These goals are consistent with the IOF process.

Paul Bryan discussed the chemical/polymer industry's technology roadmapping process as carried out in the national IOF program. Several technology roadmaps are being developed through facilitated workshops of approximately 50 people each. The technology roadmap on separations is now complete. Paul sees IOF as an opportunity to develop synergy between different industry groups. He also believes it is a catalyst for creative solutions and approaches that result when seemingly unrelated industry sectors discuss research needs, goals and priorities.

IOF-WV INDUSTRY SECTOR REPORTS

Ric Love
Century Aluminum Corporation

George Psaros
West Virginia Steel Advisory Commission

Tom Fenton
Fenton Art Glass Company

Hal Foss
Rhone-Poulenc, Inc.

Brent Blalock
B.A. Mullican Lumber & Manufacturing Company

Lou Minehardt
HK Casting, Inc.

IOF-WV INDUSTRY SECTOR REPORTS

1. ALUMINUM

1.1 Breakout Session Notes:

Sara Dillich of IOF gave an overview of some of the DOE programs, including the Inventions and Innovations program. The Aluminum group has about $8.2M in FY99, with $2-3M of that in new money. She remarked that perhaps development of a "project" was not the first step, rather that coalitions of industry, power companies, mining companies, etc. might be a good first step.

Brian Joseph commented that the potential for integrated production was huge in the steel industry, and there were probably similar opportunities in aluminum. Bill Pollock of AOI Consulting said he is working on a concept whereby small power plants would be built near and tied to major consumers, such as aluminum plants. Sara said this might be of more interest to the Cross Cutting Technologies group than to the Aluminum.

The meeting was run more as a discussion than as a series of presentations. This format seemed to work well. Subodh Das said he had developed some contacts with the Southern Technology Council and suggested they might be useful members of a coalition.

Ultimately, three working groups were formed around three project ideas:

- Ingot cracking: Arco/University of Kentucky/WVU/Century
- Data mining: Century/WVU/University of Kentucky
- Strategic planning and control for electric cost minimization: WVU/AOI Consulting. (Possibly contact other industries such as steel and chemicals regarding their interest in electric cost minimization.)

1.2 Breakout Session Report:

Ric Love:

This group was much different from last year's, where we did a lot of brainstorming and struggling with the question of "What projects should we do?" This year we immediately began discussing the projects we know should be done. As we started trying to reduce the number of projects that we thought were critical, we found people saying "Well, whether we list that one or not, we're doing it." I think that's a sign of how far things have come since last year. This year we're talking about what we are doing, but we still need to join together and get a little better synergy on how we're getting all these projects done.

We've established a regional group for the aluminum industry. Subodh Das of Arco Aluminum is here representing Kentucky and their interest in Industries of the Future. Subodh said one-third of the aluminum produced in the U.S. is produced in Kentucky. One of the problems we've had in West Virginia is that in terms of primary aluminum production, we're (Century Aluminum) it. So when we start trying to work on all these projects we find that money is not the issue nearly so much as time. So finding a number of other players will allow us to join together to approach some of these projects.

1.2.1 Metal treatment in grain refining.

This remained at the top of the list, although it is not strictly a West Virginia endeavor. There is an established group working on DOE-funded projects. We talked about our willingness to join should some of their other partners not be interested in going forward. There is also synergy and expertise in terms of other projects.

1.2.2 The systematic view or overall control of the enterprise.

We discussed some of the major issues in trying to coordinate a number of different departments for the best overall results. One of the big opportunities, we think, is to systematically optimize the overall manufacturing system. There are major savings if we can come up with a way of doing that. We've already started working with companies such as Applied Industrial Solutions and Touchstone on this.

1.2.3 Control of solidification

In the hard alloy plate series, there are problems with cracking. WVU is working with us on that particular alloy to help improve control systems.

1.2.4 Data Mining

We inferentially control almost everything on the reduction side based on only two sets of numbers we get for each cell. We've begun some efforts with WVU to look at methods of using much more of the available cell data. Again, Kentucky says this is a major issue for them and they are very interested in this issue.

1.2.5 Coal-based coke and pitch products

Century Aluminum has worked with WVU for some time now on use of coal-based feedstocks for anodes. We talked about who else would be in this group, and again Kentucky said that they would be very interested. WVU has been leading this effort for some time now.

1.2.6 Energy Usage

We use about 350 megawatts at our single site, which for reference will just about run Huntington, WV. So one of our major issues is power. With deregulation, power companies could have less and less excess power available, so how do we get at ways to use that? Muhammad Choudhry has done a lot of work already in developing schemes that would allow us to predict demand usage and to modify operations to take advantage of off-peak rates.

I'm always surprised at the unexpected information that comes up at these IOF-WV meetings. For example, one person in our group knew about the Southern Growth Council. They are possibly another vehicle for us to look at in getting our projects going. Are there ways to work with them? We didn't really come up with an answer to that one, it's just an interesting possibility.

The other one is regional interest groups. We heard this morning about the population density within 500 miles of West Virginia. If you look at it in terms of industry, there are also lots of possible joint efforts and partnerships that would be very beneficial. Again with Subodh in the group, we talked quite a bit about how West Virginia and Kentucky might work together on some of these projects.

Opportunities have deadlines. If we want to get our projects into this year's aluminum solicitation, they've got to be in place by February. Some projects, such as the systematic view of the manufacturing enterprise, might fit into the Inventions and Innovations Program or the NICE^3 Program, and that gives us a little more time to put something together.

1.3 Ongoing projects and proposals submitted

Century Aluminum is currently participating in a $2.2 million IOF project with EMEC Consultants, NSA Division of Southwire Company, and SGL Carbon Corporation to develop new potlining additives for increased energy efficiency in primary aluminum production. A proposal titled "Intelligent Potroom Operation" has been submitted to the 1999 IOF Aluminum solicitation. This is a collaboration between Century Aluminum, Applied Industrial Solutions, and WVU.

1.4 Additional project topics of interest to the Aluminum Industry:

- Understand anode property optimization
- Reduce cost of electricity
- Develop central anode processing sites
- Capture CO_2 and develop uses for CO_2
- 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 downtime
- 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

1.5 Aluminum Breakout Session Attendees:

Larry Banta	Sara Dillich	Bill Pollock
Jan Berkow	Brian Joseph	Peter G. Stansberry
Philip Biedler	Bruce Kang	John Zondlo
M.A. Choudhry	Ric Love	
Subodh Das	Joe Megy	

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2. STEEL

2.1 Breakout Session Report:
George Psaros:

The steel industry group selected five projects that we think are important to the future of West Virginia's steel industry.

2.1.1 Explore and identify proper materials with improved resistance to liquid metal corrosion for applications for hot dip metallic coatings.

One of the fastest-growing processes in the steel industry is galvanizing lines. Weirton Steel and Wheeling Pitt both have galvanizing lines. Wheeling Nisshin uses an aluminized coating. In order to coat the steel - let's take zinc for an example - we have to put the steel plate through a zinc bath. To guide the steel strip through that bath, there are a series of rolls which are supported by bearings. The industry standard we use currently is stainless steel bearings. They are better than the hardened steel bearing; however, they still don't last. They corrode and deteriorate. Which means after so many runs, you have to shut down, pull out the roll, change the bearings, and then continue production. You have maintenance time and production downtime which affect your productivity and, in many cases, affect your quality. A group from WVU is currently looking at this problem. They are working with Wheeling Nisshin and Weirton Steel and also with Oak Ridge National Labs. They've done some preliminary testing, but we have not yet found the optimal materials to use to make these bearings.

2.1.2 Near net shape casting technology for quality and cost improvements

Probably the one mill in West Virginia that uses this technology is Steel of West Virginia in Huntington. If you're going to make an I-beam, normally you start out casting a billet. This billet might be a 6x6 or 8x8 cross section. You then heat that billet up and put it through your finishing mill and convert that into an I-beam. It would be much more efficient if rather than casting a billet, you cast it to the shape of an I-beam. There's a huge energy

saving and certainly a productivity savings here. Steel of West Virginia has done some of this work on their own - they've put a considerable amount of money into it. There is still a lot of work to be done and I think in April a team from WVU is scheduled to go down to Steel of West Virginia and discuss this with them.

2.1.3 Develop non-chromium based chemical pacification to prevent white rust on hot dipped steels.

Let's again take galvanized steel. What happens when the galvanized steel comes off the line in the form of a coil and you set it out on the shop floor ready for shipment, in very damp weather especially? It collects moisture and develops a surface scale that looks like white rust. In order to minimize or eliminate this problem, most companies spray the galvanized steel with a chromium based chemical as it comes off the line. It does a fairly good job but there may be something better out there. Since this is a chromium-based treatment, we don't know how long the environmental people will allow us to use it. It's an important problem that affects Weirton Steel, Wheeling Pitt, and Wheeling Nisshin here in WV.

2.1.4 Form a series of workshops for cross-industry energy teams.

The cost of energy, gas, oil, potable water, steam, and electricity to the steel industry is about 15% of our manufacturing costs. Any way we can minimize energy costs will be extremely important to our industry and to other industries represented here today that have high-energy costs. To try to identify projects, to reduce that cost, at a forum such as we have today, would be difficult. It's hard to meet as a group for an hour and a half and say, "Let's meet and talk about energy." I think probably the best way to handle that is to have the IOF-WV group get a cross section of industry representatives together for a series of workshops. This will serve two purposes. First, we can identify projects of common interest and, secondly, we can learn from each other's experience with energy cost reductions.

2.1.5 Have a workshop on process control sensors.

There are a lot of new sensors out there that could give you two things: 1) better quality products and 2) improved productivity. We could run steel faster if we had the proper sensors. We found that out unfortunately at Weirton in 1994 when our tandem mill burned. When we came back and built that tandem mill after the fire, we upgraded all our sensors. And where we used to run, for example, at 5,400 feet/min. we're currently up an average 6500 feet/min. and we think we can do better. So basically what we're suggesting is to have the IOF-WV group organize a workshop where we can invite vendors in and have them talk to our people about the latest sensors.

Q: Is there any technical side to the steel dumping issue? Any technical projects?

A: I discussed something about dumping before we broke up to go to our sessions. Any of these projects would help us to become more efficient and more productive. I told my group when we met that I've been in the steel industry for 34 years. When I started with Weirton Steel we had 12,000 employees. We're down to around 4,300 today. And we make more steel today than we did back when I started and a better quality steel. So the steel industry, I think in this country, has become very productive and very efficient, but there is no way that we can compete against steel that is dumped here. And earlier this morning I gave you some of the statistics about what steel means to the state of WV. Because, remember, the steel and steel-related industries represent 17% of the manufacturing base here in the state, and 20% of

the income from manufacturing or wages is paid out by steel and steel-related industries. These are the type of industries we've got to keep. These projects we've discussed will certainly help us in the steel industry. But until this dumping is eliminated, we've got real problems in the steel industry. I see Senator Rockefeller here and I'm sure he's working on it every day.

2.2 Ongoing projects and proposals submitted

With the help of Dr. Gopalakrishnan, Weirton Steel has written a proposal to the NICE[3] program to install the Rapidfire Edge Heat technology. Current hot strip mill technology uses only one heat source, the reheating furnace, located at the start of the process. Because a steel slab cools non-uniformly during hot rolling, the total slab is overheated. The proposed project will demonstrate an edge heater that is located prior to the finish-rolling step. This edge heater technology would result in higher quality steel, fewer defects, reduced energy use and lower emissions.

2.3 Additional project topics of interest to the Steel Industry:

- Reduce casting costs (near net shape, thin, speed, clogging, productivity)
- Reduce energy costs (joint with utilities, 15%)
- Reduce costs--keep it cheap!
- Refractories
- Electrodes
- Worker'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

2.4 Steel Breakout Session Attendees:

Peter Angelini	Tom Holder	Richard Nester
Richard Bajura	Bill Kiefer	Scott Richlen
Jim Bowen	Jian Mao	Scott Rotrick
Keh-Minn Chang	Toni Marechaux	Tom Ruberstein
Tim Duke	Robert McLaughlin	Patrick Siewny
B.Gopalakrishnan	Martha Moore	Kurt Sisson
Antonia Herzog	Jim Mosby	Wanhong Yang

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3. GLASS

3.1 Breakout Session Notes:

Beri Fox reviewed projects and activities under way by the Glass Industry Group. The applied laser project was acclaimed as one of the success stories that highlighted the past year of the IOF-WV Program. During the group's breakout meeting, Steve Woodruff showed a videotape of his current laser glass-cutting capability. Other group actions included further development of a fiberglass utilization project and further definition of laser cutting technology for tempered glass.

3.2 Breakout Session Report:

***Tom Fenton**:*

We had a good discussion in the glass group. We've had eight or nine meetings over the past two years, and I think we're becoming a very good working team. We've seen a lot happen just since last year's meeting, as you all have. The glass industry projects that we discussed today are as follows:

3.2.1 Applied laser system for enhanced cutting and finishing.

When you form an item with a blowpipe, you need to separate the blowpipe from the piece. If you want that piece to have a precision opening, such as the bottom of a lamp shade or the top of a salt and pepper shaker, then somehow you have to cut it off - either hot or cold. We have too many problems with loss of glassware and with additional labor costs to finish up that piece of glass as we would for example with a tumbler. Steve Woodruff of FETC gave us a presentation on his initial experiments with a new method of more precisely making that cut while the piece is still hot, thereby avoiding some of the risk of injury to someone trying to work with a rougher top or cold-cutting it off. We were all interested and encouraged by the initial results of Steve's work. That project has been approved for

funding, and we appreciate that very much. We especially appreciate the support Jeff Herholdt and the WV Development Office and WVU gave us to make this into a project and get that funding.

3.2.2 Fiberglass cuttings and waste utilization

We learned in the meeting today that in the fiberglass industry, when you trim the product to the right size for shipment, there is a lot of waste material. Fiberglass manufacturers spend a lot of effort and money gathering waste material and shipping it off to a landfill. Two of West Virginia's fiberglass companies are working together with WVU on alternatives to dumping this waste into a landfill. The approach is to make the waste cuttings into a formable product or material which can be made into other products. They have finished a study identifying possible uses. The next step is that the OIT and Jeff Herholdt in the WVDO are going to help them formulate a NICE^3 proposal.

3.2.3 Applied laser systems for precision cutting of tempered glass.

When we were discussing laser cutting and the crack-off problem this morning, one of our members suggested the application to cutting of finished tempered glass shapes to very precise tolerances. So we're expecting to have a feasibility study in the next few weeks or months, and that possibly may become a project in the future.

Other projects that need further discussion are: (1) new refractory materials for corrosion resistance; (2) enhanced furnace design through combustion simulation; (3) new concepts for exhaust flow scrubbers (e.g., bubbling the particulate and exhaust stream from a furnace back up through the glass, thereby capturing the particulate instead of having to scrub it out some other way). This is just a conceptual discussion at this point and is not ready to be proposed. Another idea that came out of our discussion this morning is the potential use of the laser to produce decorative effects in artistic glass, such as coloring, shaping, or restructuring the surface. These and other uses will become obvious as soon as the first laser glass cutting/finishing machine goes from the lab into someone's factory. All of a sudden innovative things will happen that no one imagined.

Q: Do you think everybody knows what NICE^3 stands for?

A: National Industrial Competitiveness through Energy, Environment and Economics. It's a joint federal and state government and industry grant program for cooperative demonstration projects that are near commercialization phase. The grant is for up to $400,000 with a 50% cost share.

I do want to point out one thing again. It was the tremendous support of WVU, the Governor's office, Jeff Herholdt and others, in helping IOF-WV get off to a fast start last year. It is great that we have Darren Huckaby, a former intern in our industry and student of Ed Sneckenberger of WVU. He now works for Eagle Convex Glass in Clarksburg, WV, and is a member of the glass industry committee. I think I heard his boss assigning one of these projects to him as they were walking out the door!

3.3 Ongoing projects and proposals submitted

An applied R&D project is under way to dramatically decrease waste and improve productivity in the manufacture of handblown glass products. An enhanced method to cut and finish glassware using a laser is being developed through the teamwork of the Federal Energy Technology Center (FETC) in Morgantown, WV, Fenton Art Glass in Williamstown, WV, Pilgrim Glass in Ceredo, WV, and West Virginia University in Morgantown.

3.4 Additional project topics of interest to the Glass Industry:

- 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

3.5 Glass Breakout Session Attendees:

Rashpal Ahluwalia	Jeff Herholdt	Richard Quaranta
Russ DeLong	Darren Huckaby	Marsha Quinn
Roger Duckworth	Theodore Johnson	Ed Sneckenberger
Tom Fenton	Kim Larew	Steven Woodruff
Beri Fox	Ralph Plummer	

4. CHEMICALS/POLYMERS

4.1 Breakout Session Notes:

Discussion of the need for an Extrusion Processing Center at West Virginia University

- Cannot do anything in polymer industry without extrusion
- Some concern that the Center would be too broad to meet industrial objectives without first identifying downstream manufacturers of products
- Make sure the Center focuses on industrial applications
- The state could attract more small plastics manufacturers and molders by having this Center and associated expertise available
- There are many industrial problems that need to be studied, including applications requiring mixing and reactive extrusion
- Significant industrial need and support must be demonstrated to get consideration from OIT for funding a skill center
- Center must be sensitive to the IOF mission to reduce energy usage and improve waste conservation

The Center should be used to:

- Study the chemical and physical properties of polymers
- Test materials made for industrial applications
- Expand testing of polymer materials for new applications

Discussion of attracting downstream manufacturers to West Virginia

- Tax disincentives from past years have been eliminated
- Need to use technological enticements that West Virginia has available to attract downstream manufacturers to West Virginia
- Small companies do not do much R&D, so emphasize that the R&D base in West Virginia can give them an edge
- West Virginia has approved sites, buildings, utilities, etc. for lease to companies coming here, and approved waste disposal procedures already exist
- Visit some of the industries we want to attract to find out from them what makes it useful to be where they are and to learn what needs to be done to attract them to West Virginia

A Rapid Prototyping Center concept was discussed that could

- Make demo parts for testing
- Make potential new products faster
- Bring innovation and process enhancement capability to downstream manufacturers
- Interact with the Extrusion Processing Center

The group discussed and tried to focus on the big picture for chemicals in West Virginia in the next decade. Most considered the State to have two areas in the chemical industry, polymers (Parkersburg) and specialty/intermediate chemicals (Kanawha Valley). Some specific comments were made:

- West Virginia has extensive specialty and intermediate chemical production in the Kanawha Valley that also needs considerable attention

- 75% of Kanawha Valley residents support the chemical industry; this is not true in many other places
- Manufacturers in the Kanawha Valley region are interested in building a chemical alliance zone
- Kanawha Valley already has tremendous infrastructure and an industry that can get parts in a matter of hours; this is not true everywhere
- Other chemical industry sectors in WV also should be reviewed in developing a master plan for the chemical industry in the state
- Above all, WV must invest in growing state versus individual businesses

OIT involvement was discussed

- Need to focus on productivity, efficiencies, and competitiveness as important issues
- While energy savings come along with process improvements, energy alone is not the primary issue for the chemical industry in WV
- We need to partner industry, government and academia to do what makes sense for helping the different chemical manufacturing sectors in the state
- To secure OIT support requires a technology component

Several industrial members mentioned the importance of a zero discharge policy

- This is an incredible challenge that the chemical industry is interested in achieving
- How we get there is still unknown
- We need help in developing a discharge technology to accomplish this goal
- This issue was strongly endorsed by five of the six industrial representatives

Degree of interest at session end by industry representatives in ideas developed during session

- Total discharge technology and reuse development – 5 of 6 representatives
- Polymer Extrusion Technology Skill Center – 2
- Rapid Prototyping Skill Center – 2
- The comment was made that these three ideas also would be of as much interest to downstream manufacturers' interests
- All three can grow new businesses for West Virginia as well as support industries already here
- The suggestion was made that there is a strong need to start in-state regional focus groups to look at these areas in more detail
- We need to collect data on what is made in West Virginia now, what uses there are now and examples of what can be added
- Determine the chemical or chemical-related businesses that the State should go after in the short, intermediate, and long term
- Identify some new business segments to entice to West Virginia
- Make help available to industries now operating that can solve their common technical problems

Focus groups in each area

- WVU and IOF can help coalesce polymer industry in state
- WVU and IOF can help intermediate and specialty chemical manufacturers
- Must keep focus groups at WVU in key areas of interest to chemical industry
- Should have the University coordinate the WV-IOF program for the chemical industry
- Should develop specific objectives and endpoints
- Might need to work backwards to get where we want to be as a state
- Must identify strengths of businesses, state, University to determine best directions
- Should respond to technology needs, and use IOF road maps when proposing projects in separations, CFD, catalysis, materials, computational chemistry, materials

A session summary was prepared and presented to the entire IOF-WV meeting audience by volunteer Hal Foss of Rhone-Poulenc.

4.2 Breakout Session Report:

Hal Foss:

The Chemicals and Polymers group may be struggling a bit with this IOF concept, certainly more than some of the groups that have just spoken. One of the things that characterize the chemicals industry in West Virginia is that it is geographically divided, and I think that's only a happenstance. You have the industries up and down the Ohio Valley that tend to be associated with the polymer industry. They tend to be growing. They tend to be strong. And then you have a number of industries that are down in the south-central part of the state through the Kanawha Valley, Putnam County, Cabell County, and Wayne County that tend to be the established chemical companies, that have a lot of steel in the ground. Their interests are really survival and how to use more effectively the assets they have. And a lot of the things we wrestled with in our group today were along those lines and I think we may have had a little trouble coming to an agreement. We were able to identify some potential directions we can move in.

4.2.1 Polymer extrusion technologies center at WVU

There is a lot of interest in forming a Polymer Extrusion Technology Center at WVU. That's of common interest to the polymer industries throughout the Ohio Valley – it's all about mixing. How do you mix in additives? What is the effect of those additives? And various things like this. An extrusion technology center at WVU could be very effective in terms of providing useful information. This is probably a short-range goal and one that we'll try to move forward on fairly quickly.

4.2.2 Zero discharge technology

One thing that is of interest across the state is a desire to move towards zero discharge technology. Believe it or not, there is widespread industry support for such a concept. This may surprise many of you who are not so familiar with the chemical industry, but we're moving very much in that direction. We think it fits in nicely with the image of West Virginia - and with improving that image.

There is a new organization that has pulled in leaders from extremely diverse groups. It is called West Virginia Future Search. This group is meeting once or twice a year and looking for issues of common interest. This group includes labor leaders,

business people, academics, and environmentalists. One of the things they identified is a need to move to zero discharge. This could actually give West Virginia a true competitive advantage and an improved image.

4.2.3 Regional focus groups/implementation of target projects

Because we had two different regions with really divergent interests, one of the things that we decided to do was to get more definition. So we're going to work on trying to form some regional focus groups sometime probably in January. We need to identify and/or implement target projects. The projects listed below could be among the target projects we're looking at. And a critical need of the state is to identify the industry segments that we want to attract into each region. These target industry segments will then lead us to the technologies that should be developed to attract these industries.

4.2.4 Recreational equipment industry

We did identify one industry segment that we consider to be of statewide interest - the recreational equipment industry. This has widespread synergy with the state's industry. It would tie in with steel, aluminum, wood products, and polymers. So we think that we should continue to work hard in that area. And one of the critical things that we think would give us an advantage in terms of being able to do that is the ability to do very rapid prototyping. We think the Robert C. Byrd Center could be instrumental in making that happen. They could be an important enabler in trying to develop this industry.

4.3 Ongoing projects and proposals submitted

A proposal entitled, "Research, Commercialization, and Workforce Development in the Polymer/Electronics Recycling Industry," has been submitted to the U.S. DOE Federal Energy Technology Center.

The overall objective of this project is to facilitate a multi-faceted approach to the disposition of end-of-life electronic products with a primary emphasis on polymer recovery processes and the use of post-recycling materials.

4.4 Additional project topics of interest to the Chemicals/Polymers Industry:

- 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, and 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

4.5 Chemicals/Polymers Breakout Session Attendees:

Paul Bryan	George Keller	John Richards
Joe Castrale	Hank Kenchington	Michelene Sheppard
Gene Cilento	Frederick G. Kolb	Leslie Smith
Robert Cook	Thomas C. Linder	Garth E. Thomas
Judith A. Dyer	Daniel J. Maloney	Jeff Tucker
Halcott P. Foss	Alex McLaughlin	Brian Valentine
Frank Gilmore	Rolland R. Phillips	David Winger
Tracy Gossard	James Quinn	

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5. WOOD/FOREST PRODUCTS

5.1 Breakout Session Notes:

The breakout session began with a brief overview of the last year's IOF-WV activities from Vic Hutchinson. Doug Kaempf, representing OIT, made some opening remarks about the program. His primary point was that the hardwood industry needs should be brought to the national level through AF&PA.

The main part of the program began with a presentation by Victor Mucino from WVU about the thin-kerf project results. Industry discussion following the presentation focused on the benefit of developing thin-kerf technology that can eliminate cooling equipment and guides on current thin-kerf technology, as well as reducing energy requirements through blade thickness reductions. Additional suggestions included remaining aware that equipment technology must keep pace with blade technology; do not focus solely

on circular blade technology, but also on band saw technology, which poses problems when cutting thicker lumber; and, being sure to have a blade manufacturer involved in the program. Barry Cook from Coastal Lumber Company offered his company's assistance in developing and testing a prototype thin-kerf blade.

The next phase of the meeting focused on a review of log-scanning technology, which was one of the priority topics from last year's meeting. Ed Thomas from the US Forest Service made the presentation. Industry response was that the concept has tremendous potential for the industry, but at this time only 5 or 6 companies could afford the technology. Support was also evident for x-ray and other scanning technologies, which are ideal in terms of accuracy, but tend to be prohibitive in terms of cost.

The final presentation covered lumber scanning and processing technology, which was also a high priority from last year's meeting. The presentation was made by Powsiri Klinkachorn from WVU. Industry felt that the current state of the technology was too slow for commercial production use, but encouraged further work to get throughput speeds to production levels.

Following the presentations, the floor was opened for discussion. One industry representative advocated the use of low-grade lumber for construction and recommended that more work be done on developing hardwood stress grades and machine stress rating procedures.

Another industry participant noted that the American Forest and Paper Association (AF&PA) is probably not the best source of information on the needs of the solid hardwoods business. Furthermore, small hardwood mills generally do not have the capacity to fund or conduct research and development It was also mentioned that small businesses have a difficult time communicating with a large agency like the DOE.

Valri Robinson said that OIT usually does not accept unsolicited proposals. She suggested that future breakout sessions have more industry input and fewer prepared presentations. In response to a question about how OIT selected focus industries, she stated they were originally based on energy usage estimates, which is why pulp and paper is receiving the lion's share of funding in the forest products area. She did cite some funding that has been provided for studying VOC's from lumber dry kilns. Echoing Doug Kaempf's earlier statement, she indicated that the hardwood industry, in order to have its concerns heard, needs to work through AF&PA task groups.

5.2 Breakout Session Report:

Brent Blalock:

Our company, B.A. Mullican Lumber and Manufacturing Company, has a sawmill at Richwood, WV, a sawmill at Ronceverte, WV, and a wood flooring manufacturing plant at Ronceverte, WV. I'm sure there are people in this room who will be very happy to know that all three facilities are being considered for major expansions right now.

This wood/forest products group is a very divergent group - the industry itself is extremely divergent. One thing that we found out this afternoon was that DOE is getting some very good information from the AF&PA and there is no question about the quality of

the information. The DOE is exerting a lot of energy and research funding in that direction. And all of that made sense, except for the fact that we in the hardwood portion of the industry aren't getting our story out. So, we had a very good exchange of information. I think probably what we learned is that we need to be sure that the hardwood portion of this industry communicates our particular set of problems to DOE so that they can help us even more. They have been quite helpful to us.

5.2.1 Thin-kerf saw blade

Victor Mucino, here at WVU, I thought made an extremely good presentation on the thin-kerf project. I was very surprised at how much the research group accomplished in less than a year. They put together a very good project that tells us all that there are some real possibilities of reducing the size of a saw blade that's involved in mass production of wood. We're talking about probably secondary cuts rather than primary cuts at sawmills. That helps us in three ways: greater production; reduction of wood waste - which is a huge problem within this industry; and probably even more energy efficient cutting. Those are three things we are very concerned about. Everybody in this industry has to be concerned about the cost of energy, and I noticed George Psaros' statement about 15% of the steel industry's production costs being for energy in some form. I'm embarrassed to say I don't know what portion of our production cost is energy but it would be extremely high. And when you're getting into those high percentages, you start looking at ways to better manage and to turn things around. Actually, the wood industry is getting so competitive that we have to look closely at every cost center, as I'm sure all of you do. We want to turn them into profit centers if we can. There is lots of potential in wood waste management and there are huge problems in our industry in wood waste management.

5.2.2 Develop alternatives to control thin-kerf heat dissipation without using accessory systems.

We do have thin kerf cutting, but we have to cool the saws. When we cool the saws, we get into environmental problems because that coolant has to be collected, recycled, and controlled in its entirety. Saw mills have a tendency to be located near streams, so you have surface runoff problems. West Virginia already has a National Pollution Discharge Elimination System. The state of Virginia is just now going to that, so instead of dealing with storm water runoff permitting in Virginia, we'll be going to Virginia Pollution Discharge Elimination System permitting very similar to the state of West Virginia. As those of you involved in that are very aware, that is much more comprehensive and also much better for the environment.

5.2.3 Log scanning technology with firm focus on equipment development.

This topic seems to be further out than some of the other technical things we talked about. The industry is very much in agreement that there's potential there. We need to be able to tell how to cut a log efficiently. I think that technology is probably there, but it's extremely expensive. The cost of handling the log and the time cost in scanning the log is not yet where the industry can use it. But the technical data and the technical capability are there. I think 10-15 years from now we may look back and say, "You know I remember when we thought that was just a pipe dream - we didn't think that technology could emerge quickly enough for me to see it in my career."

5.2.4 Lumber scanning

Industry interest is extremely high. At our wood-flooring manufacturing plants, it is very critical that we cut each slab the most efficient way we can. We want to make as few cuts as possible to minimize waste generation. All wood-product manufacturers have the same problem, when you generate sawdust you've got to deal with it. Wood waste products have some resale value, but still you've got a cost in handling it.

My formal training is in architecture and I find it interesting that the construction industry went away from wood as a framing product a number of years ago because of code requirements and a lot of things. Now we're getting back toward that and I think over the past 15 years, you probably saw less technology coming from the wood industry. All wood framing is now softwood. I have no idea what percentage of the forestry industry in WV is hardwood versus softwood, but I deal in hardwood. Most loggers won't even bring softwood onto our sites because they know we'll just have to load them out and send them to someone else. The concept of going to hardwood allows us to use lower grade timber from second and third growth sites. And it's actually good for many of these sites to recut them. Our forestry management people know far more now than they did 10-15 years ago about how to environmentally protect a site when cutting. We find that sites actually benefit from cutting. I am aware that nationally the forest industry actually sees more regrowth annually than it does cutting. I wasn't sure if that was necessarily the case in West Virginia but I understand it is. Nationally, it's somewhere in the neighborhood of 30% and that's impressive.

Those are some of the areas we covered. I feel like it was a very good opportunity for us to get with the DOE people and the research people. I think these sessions are a great help to the wood/forest products industry in West Virginia.

Q: What is the split between softwood and hardwood in West Virginia?

A: Essentially 100% hardwood in West Virginia.

5.3 Ongoing projects and proposals submitted

Wood Industry Assistance Grant – 1999 - $30,000
January 1, 1999 – December 31, 1999

Objectives:
Conduct eight industry projects to help increase client profitability by improving productivity, improve efficient use of energy resources, and minimize the production of waste products. Projects to be addressed will be consistent with IOF-WV Wood/Forest Products Industry Group priorities. Interim and Final Report presentations to the clients are required.

Proposal for thin-kerf saw project was submitted in December. This project is designed to investigate the use of composite materials to make thinner saw blades which will produce less waste and use less energy. The project is to be managed by Oak Ridge National Labs.

There has been contact with NASA and Inco Alloys about a project to develop thin kerf saws from Inco high strength steel. The material requires some specialized heat treating to relieve

thermal and processing stresses in the steel, or the blades warp. The process has been worked out by NASA but its specialized, and Inco doesn't have the equipment in house to make it work. They have shelved the project. Larry Banta is trying to work with some heat treating companies to see if the capability is already extant somewhere, and how expensive it is. If it's either not available or prohibitively expensive, WVU will work on getting a research project to develop a process/equipment to make it all work.

5.4 Additional project topics of interest to the Wood/Forest Products Industry:

- 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 boards is a problem with bandsaws
- Co-firing of wood residue with coal in power plants - also reduces sulfur emissions
- Wood dust 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

5.5 Wood/Forest Products Breakout Session Attendees:

John Baumgras
Brent Blalock
Dick Bowlby
Barry Cook
Barry Frazee
Charles Friddle
Jeffrey Hare
Curt Hassler
Powsiri Klinkhachorn
Doug Kaempf
Victor H. Mucino
Tim Pahl
Valri Robinson
Paul Schreffler
Al Steele
Joel Stopha
Ed Thomas
Dick Waybright
Lanny Williamson

6. METAL CASTING

6.1 Breakout Session Notes:

Lou Minehardt showed a video on flowable fill indicating how a Cleveland casting plant was able to work with the Ohio DOT to utilize spent sand as flowable fill in road projects. Lou also had an article from *Modern Casting* which indicated that the Ontario Minister of Environment approved foundry sand for use as a cover and as "engineered fill". Bob Creese will obtain a copy of the AFS Foundry Sand Beneficial Reuse Manual.

It was mentioned that Ohio State University may have information from their Die Casting Research Center on release agents that may be viable for permanent molds. There was discussion on the reclamation of wax for investment castings. The filler usually goes to the land fill, but the wax can be used as a fuel or sent for reclamation.

All members use induction melting, and would like to reduce electricity costs through group purchasing, if possible. Members are to bring their needs to the next meeting to determine what the total need would be and if savings could be obtained through group purchases.

Can we get local power companies to arrange meetings to assist in the development of new export markets and customers like American Electric has done in Wheeling?

6.2 Breakout Session Report:

Lou Minehardt:

The metal casting group started a year late, so we had a lot of catching up to do. We have had a couple of pre-conference meeting to discuss some issues. This morning we had four metal casters, two iron foundries, a permanent mold aluminum bronze foundry, and an investment caster. The topics we identified present some significant challenges.

6.2.1 Foundry sand disposal problem

One of our most significant challenges is finding acceptable beneficial reuses for some of our by-products. In the iron foundry business, that by-product is basically spent foundry sand. In the investment casting business it is wax. We need to find a cost effective way to recycle that material and find uses for it. In our breakout group this morning we viewed a very interesting video that we obtained just yesterday. It demonstrates a cooperative project between an Ohio cast metals group, the Ohio DEP, several companies, and Ford motor company on reuse of spent foundry sand from Ford and other foundries as a flowable fill concrete application. This is very exciting to us. It appears that a lot of the technological work has been done and with luck the environmental problems have been addressed. We're hoping we can bring it to the state of West Virginia and obtain favorable consideration for similar applications here. It would be a tremendous benefit to our particular segment of the foundry business.

6.2.2 Reduction of carbon dust from release agent in permanent mold

We discussed the possibility of alternative release agents for permanent mold applications. A graphite product which, as I understand it, is the most effective release agent, but it does present some dust and other workplace problems. Several interesting concepts were discussed.

6.2.3 Potential Use of Carbon Foam

- As composite material for metal matrix (aluminum or steel)
- As a filter
- As an insulator
- As a conductor (crystalline state) for permanent mold

We were all very interested in the potential use of the carbon foam products being developed here at WVU. I think everyone was sitting there brainstorming on how this material could work for us and how we can benefit from using it. Dr. Stiller briefly discussed experimentation on carbon foam/aluminum composites. The aluminum did not penetrate the carbon foam because of poor wetting of the carbon by the aluminum. The pores will be increased in size for the next test.

6.2.4 Purchasing Consortium

We discussed pooling our purchasing power among the companies to see what common materials and items were used. The group discussed how we might benefit from deregulation of the electric power industry.

6.2.5 Develop Export Markets

We shared some interesting concepts with the Hubco people on their experiences with the export markets and the benefits they felt were gained from that. So that is on our agenda to follow up on.

I'd like to thank everyone for the opportunity to be part of this very exciting approach to how we might all work together to gain common advantages.

6.3 Ongoing projects and proposals submitted

The metal casting group has submitted two preproposals:
"Dust Control for Permanent Mold Metalcasting Facilities" - $134,700
Investigate a new process of molding to eliminate the need for airborne release agents. The new process would utilize a graphite insert which would replace the non-reusable graphite spray release agent. The research would involve the design of graphite insert considering several factors such as the life of the insert, the thickness of the insert required, and the form of the carbon for the process.

"Beneficial Re-Use of Foundry Sand" - $50,000
A number of potential uses have been identified for spent foundry sand in which the sand becomes an input into another process. For commercial and regulatory reasons, use of spent sand in applications such as flowable fill, construction aggregate, asphalt, etc., has been relatively minimal. This proposed research would produce data on sand chemical

composition and performance characteristics necessary to address regulatory and commercial concerns to create demand for spent foundry sand.

6.4 Metal Casting Breakout Session Attendees:

Jim Bond
Bob Creese
Joseph G. Dakan
Jim Dean
Davey Douylliez
Terry Hamm
George Houston
Gobind Jagtiani
John MacKay
Tom Mahoney
William Mankins
Lou Minehardt
Pat Minehardt
Charles Sorrell
Al Stiller
David Webb
John Wright

WEST VIRGINIA INDUSTRY IN 2020: A FEDERAL VIEW

Senator Jay Rockefeller

Denise Swink
Deputy Assistant Secretary for Industrial Technologies, U.S. DOE

Dr. Leslie Smith
Director of Material Science & Engineering, NIST

Session Moderator:
WVU President David Hardesty

WEST VIRGINIA INDUSTRY IN 2020: A FEDERAL VIEW

FEDERAL PANEL: *Senator Jay Rockefeller; Denise Swink, Deputy Assistant Secretary for Industrial Technologies, U.S. DOE; Dr. Leslie Smith, Director, Material Science & Engineering, NIST*

President David Hardesty:

We move now to the portion of the program in which we're going to take a federal view of Industries of the Future looking out, say, to the year 2020. And we're going to begin a three-person panel with remarks from U.S. Senator Jay Rockefeller.

Senator Rockefeller's story is quite well-known. I first met him 32 years ago when I was a student at the university and we started a program called the Festival of Ideas. One of the speakers we invited was a young person interested in government and public service who was a volunteer worker in Emmons, WV. He was running for the West Virginia House of Delegates and we thought he would be a dynamite person because of his name, his engaging personality, and his dedication to politics. That was Jay Rockefeller's first visit to this campus – 32 years ago – and I've known him ever since.

When he was governor of West Virginia, I had the opportunity to serve by his appointment as Tax Commissioner and to work closely with him on a state tax reform commission. I've had the opportunity to travel with him to the Far East to promote exports and, over the years, I've really grown to respect his ethic of "public service first." Just a couple of examples: The first is his long-time effort to increase exports and foreign investments in this state. It began in the late '70s, with the decision to establish an office in Japan to increase exports of coal, chemicals and other products from West Virginia to the Pacific Rim, and to achieve any kind of reverse investment. I had the great pleasure to serve as a staffer on that first trip. I remember one night when 15 CEO's of giant Japanese trading companies came out to meet this young governor from West Virginia. We called on Toyota, Norataki, NGK, and other companies which are now household names in West Virginia. As a matter of fact, Senator, Last Sunday I picked up the New York Times and saw a 2-page ad in which Toyota was talking about their $900 million investment in West Virginia – the result of a 20+ year sustained effort to get that company here. Jay Rockefeller, along with Governor Underwood, former Governor Caperton, the West Virginia Development Office and many others, worked on it, but it is a sustained effort that brought them here and Jay has been at the heart of it.

He and his staff are working closely with chemical plant executives in West Virginia and from around the country who have plants in West Virginia to help retain that important industry in the state. He and the Governor recently spent two days at a chemical industry forum that I helped facilitate.

Similarly, at the Manufacturers' Summit, at the Greenbrier, I saw the same thing again. Many of you were there along with the Senator, the Governor, the Speaker of the West Virginia House of Delegates, and the President of the West Virginia Senate to listen for an afternoon as industry people talked, sometimes instructively, critically, but always

positively about what we could do to improve the manufacturing sector and West Virginia's opportunity to succeed in the global economy.

So briefly that's my take on Jay Rockefeller - based on 32 years of knowing the man. It's public service first and it comes from a long line of honest public servants. His mother and father were extremely well-known in the field of American volunteerism. They raised a son who wants to help other people because of the many gifts that he has in both talents and means. He's done that in a sustained way for the people of West Virginia. We are always most honored when Jay Rockefeller comes to our campus. Please help me welcome him--thank you.

Senator Jay Rockefeller:

David, thank you so much.

I always believe that intensity is important, and David does too. If I'm looking for somebody to work with, that's the first quality I look for. And then after the word "intensity" is the phrase "sustained intensity." Because I really do believe that whether it's research and development, new technologies, or new approaches to existing technologies, a sustained intensity almost always produces good results. We have a very interesting quandary--a wonderful quandary and in some ways a frightening quandary - in West Virginia. Historically, as you've heard this morning --we have steel, aluminum, glass, chemical and polymers, wood, and other "traditional" West Virginia industries that have charted our economic course, determined our heritage, and shaped our state character. They have been our manufacturing backbone and have employed thousands of people for many years during a time when we were, in fact, losing population. That was up until four years ago. Now we're gaining people. It's only a thousand people a year--that's not very impressive in Nevada, but it impresses me. Those traditional industries are now in the process of remaking themselves and activities such as Industries of the Future – West Virginia are helping give them the chance to remake themselves. You have the chance to re-make yourself, and do it on fair terms, in which you are given your chance to succeed on your merit or to not succeed because you either didn't have the merit or weren't intense enough. Because, essentially, people ought to succeed or fail that way. In any event, that's the way it is in the global economy.

A global economy is, in and of itself, a wonderful thing and a scary thing. You're presented with a classic situation - that Jim Bowen knows better than most - we're going through what was referred to before as steel dumping. (Paul Joffe will talk about that tonight with a great deal more expertise than I possibly can.) One hundred and thirty seven countries produce steel - and not all of them export steel - but they produce steel. They want to produce steel because producing steel is like having your own national airline. If you have just one mid-size 737 or something, you own it. You paint your country's name on it, it's kind of a symbol of being a country, even if you're small. If you have a steel industry, it's a little bit of the same thing.

You start exporting, you obviously can't do it with a profit, so what you do is "dump," which means you sell at below the cost of production, which is what we are now going through in this country. In the last four or five months this has had disastrous

consequences, more than any commodity at any time in the history of our country. It's not clear at this point exactly what will happen. That's the irony or the unfairness for people here trying to produce steel more efficently or to make steel products better. That is all based on the assumption there is a level playing field - something called "fairness" where if you DO have merit, then merit prevails. You can't necessarily assume that in the modern world any more.

The President can have an effect on it, and I try to make that point to him every time I see him. I think he fled an elevator in the White House recently rather than go up two floors with me because he just heard me talking about steel. He could do it. He could say that we will return to about a 20% import level - which the steel industry could live with.

I have worked assiduously over the years to design and defend a range of programs that team-up government, industry, and academia to conduct mutually beneficial research and to conduct product development that would NOT be done by any one of those entities on their own. Sometimes people have to go in together before they go in at all. They have to have a "comfort level" for financial reasons, for psychological reasons, for patent reasons, there are all kinds of reasons for that. One example of that is the Advanced Technology Partnership Program, which at one time was considered "the government picking winners and losers." That period now has passed, I hope, and the good news that I have to report to you is that research and development is getting up there with education and Social Security--Don't touch it or you're finished in public life!

There's an enormous interest in technology development programs, in doing "smart" research and development, and CRADA programs. There's an enormous interest in doubling research and development, but not the monies for it. The federal government spends almost $80 billion a year on research and development, but if you take away the military part of it you have a lot less. There was a school of thought that wanted to simply double the amount that we spend on non-defense research and development. Senator Bill Frist, an excellent Republican senator from Tennessee, and I opposed that idea. We approve of the idea of doubling research and development, but not just for the sake of doing it; we want to do it on the basis of priorities: What does industry think is most important for the country? And that you do over a period of 12 years.

The manufacturing extension program has been very effective here in West Virginia. And even as people are coming to understand it, it'll have a lot more. I've worked very hard on something called EPSCoR. That goes back to 1985 when I convinced the head of the National Science Foundation that there actually WERE universities other than Harvard, Yale, Princeton, MIT or Stanford who had first-rate researchers and that the way for some of those campuses to become better-known and more appreciated by their peers and by industry and by others, is for their researchers (who were good) to have a chance to DO research, and to participate in the federal research which the National Science Foundation puts out in rather large quantities every year. So, EPSCoR was begun. Thanks to Governor Underwood, and to Governor Caperton before him, there is an active Science and Technology Council. Sam Tully runs it and he and I are going to be meeting shortly. I want to see the EPSCoR concept extended to EPSCoT, which would emphasize technology. I happen to think that technology is taking over the world and we must be there. West Virginia must develop and commercialize new technologies.

During my recent trip to Silicon Valley, what I found interested me a great deal. I'm now pursuing it vigorously to the extent that 20% of the legislative talent in my office is working on information technology and technologies of the future. Two things are overwhelmingly clear: (1) The Internet has an enormous amount to contribute to the growth of America--that's putting it actually mildly - if we're not fully with-it on the Internet, we're going to be bypassed by the rest of the world. (2) It's already global. We can talk about decency, we talk about encryption, we can talk about all kinds of things, but it's already global. It's everywhere and the consequences are both scary and exciting.

For example, what's the future of the auto dealer? Will there only be people who fix automobiles in the future, but no more people who sell them? Weirton Steel has a web-site where they are buying and selling steel on the Internet. What about financial services? What about flower shops in Gassaway, West Virginia? What about the whole retail business?! Some suggest there could be a loss of 5-8 million retail jobs in this country. Their job isn't to figure the societal consequences; their job is to take this incredible free market idea and push it as far as it can go.

Then you come to the other side of the country – Washington, D.C. - where some people think the government has to put its hand on everything. And here you have a real clash. Because there ARE consequences to unemployment. If the Internet creates, let's say, 3-4 million jobs, and eliminates 5-8 million jobs, you have two questions. One is, how do you make up the difference? It's something like saying, "Well, I'm going to move Medicare from 65 to 67 years of age before you're eligible." I have no problem with that if you can tell me how the people get health insurance in the two intervening years. Second, how do we retrain people in their 40s and 50s who lose their jobs to technology and don't have computer knowledge and don't have Internet knowledge?

I'm basically very positive on the Internet, but who in this country or who among all of us is thinking about the societal consequences? We've been through something like this before for jobs lost to imports. We called it trade adjustment assistance, but we haven't done a very good job at it. This is part of what will take place between now and the year 2020.

I'm very proud of a plan I authored, called the "e-rate," which is going to take every school in America (16,000 school districts; 200,000 public schools), every public library, a lot of rural health centers, wire all of them up to the Internet and pay for the telephone line cost. I visited a school in Lewis County this morning—under the e-rate plan, about 70% of their telephone line hook-up costs would be paid for by something called the Universal Service Fund. The Universal Service Fund was started before Social Security when America decided in 1934 that everybody had the right to a telephone - some people had to subsidize others – it's the universal responsibility. Think about West Virginia taxes that go to the Coast Guard. Well, why in the world do we pay money to the Coast Guard when we have no oceans? Again, it's Universal Service. It's the way you hold your country together. It's the way we take care of each other when there are no perfect formulas.

What I am suggesting to you, is that this question of the new economy and all of these opportunities that are coming are inevitable, inexorable, and unstoppable. You don't want to stop them, because when Bill Gates says it's going to change the way we live and think, he's really right. Now whether he's right or wrong in his lawsuit, I don't know, and at this point, don't care. I guess my great-grandfather would have, but I don't. I mean, my great-

grandfather would have said, "What are you doing with three companies?" You never have more than one company!

The point is, what are we going to do about it? Do we have people in West Virginia who are thinking about this? Do we have public policy makers who are thinking about this? What is the effect on West Virginia? Are we going to be able to attract the new economy, the software producers? The answer is YES WE CAN. I'm walking down the streets of Shepherdstown and I look into a storefront and I look right into Husky Labs. It's run by a fellow named David Levine who's written a book on Java. He likes the lifestyle in West Virginia.

So we're changing from an industrial local economy to an informationally based, non-geographic economy. Now the bad news is, what happens if we don't get our share? The good news is, all of a sudden, mountains don't make any difference do they? It's not as important if you can't lay out the wires or build the roads - you do it from satellites. So there are all these marvelous opportunities, but the scary part that goes along with it--how are we adjusting to it? The e-rate works for K-12. Then they go through college, spend another year or two in grad school and then they get a job. Well, that's 20 years. In the Silicon Valley, that's 6 different generations! So the question is, how are we going to do IN THIS STATE? How are we going to take advantage of what the world is becoming?

I think about our traditional industries which are our backbone and remain our psychological and actual backbone. What you're doing here today will help make it possible for our backbone industries to be as good as they possibly can be. People like Paul Joffe and myself must make sure that you are going to be able to play that out on a level playing field worldwide so people don't cheat on you. Dumping, for example, violates international trade law. We have to work to guarantee fairness and you have every right to expect it.

I really hope to see great things come out of this meeting. So much is beginning to happen. If you come to see me in my office (which you are welcome to do), I'll open up the right hand drawer which is filled with things that have come from WVU research projects. Like the piece of carbon foam that I can hold at one end when it's 3000 degrees half an inch away and I'm totally comfortable. Brian Joseph and his people are working on exciting kinds of things for the carbon foam. The Carbon Products Consortium established here at WVU in 1993, which is just roaring along.

The world is full of excitement, full of possibilities, and we have to be effective in the way we in the federal government recognize and work with you. Over the years, I've come to know the people who work with Carl and they ARE first rate and they're doing extraordinary things. The "strong as steel" wood from several years ago, and flexible, composite concrete. I could bend it and I said, "Great! No more potholes!" That's what governors dream of, you know.

So, let me again state my tremendous confidence in the faculty here at WVU and the work they are doing with West Virginia companies on Industries of the Future. I am exhilarated by the future of the economy, and I am also nervous about how deeply we are looking into what exactly that economy is going to be, and how much of it is going to be within our control, and how much of it is going to be beyond our control. And where, after

four to five more generations have passed, out there, in Silicon Valley, where it will indeed be leading us.

All of that makes me feel very creative and very productive and very happy that I'm in public service and that such meaningful work is going on here. We just have a great deal to do!

President David Hardesty:

Thank you, Senator. We so much appreciate your remarks and all you do for the university. I could not catalog it here today but it spans 3 decades and I know you to be a force for good here in West Virginia and for West Virginia University.

Our next speaker will bring us an executive branch look at policy in Washington, D.C. and how federal policy can impact Industries of the Future. Denise Swink is Deputy Assistant Secretary for Industrial Technologies. She and her team at the O.I.T. have played a seminal role in originating the Industries of the Future concept and in bringing it to West Virginia. Educated at American University and Johns Hopkins University, she has spent her career in policy analysis and administration in Washington. Her office's mission is to manage a program designed to improve energy and resource efficiency in the industrial sector and thereby keep our national companies and our natural economy competitive in the global marketplace. From 1991 to 1995 she was the Associate Deputy Assistant Secretary for Industrial Technologies. Before that, she was Director of the Office of Planning and Environment in the Office of Fossil Energy. That office analyzed technology, regulatory and economic impacts as they related to extraction, distribution, use of fossil fuels. Her background includes four years in program development and management for the Clean Coal Technology Program, as well as 13 years in water monitoring and toxic substance regulation for the U.S. Environmental Protection Agency. Ms. Swink is a leading architect and advocate of partnership programs to address industry's priority R&D needs. We are very pleased to have her and her OIT team with us today. Please join me in welcoming Denise back to the WVU campus.

Denise Swink, Deputy Assistant Secretary for Industrial Technologies, U.S. DOE:

It's certainly a pleasure to be back and see how much progress has been made this past year with IOF-WV. I can tell you, President Hardesty and Carl, as I was driving up through the mountains last night and got into a real heavy fog, I remembered our first trip out here two years ago. Charles Sorrell and I were here to visit with companies in the Carbon Products Consortium. I also remember so clearly I had been trying for quite some time to encourage states to embrace the types of partnerships that we had established through Industries of the Future at the national level. One characteristic I have – and the folks in my office would probably agree – is that I can be persistent. Every opportunity I had to talk to any type of state official, I brought up the notion of an Industries of the Future type of process at the state level. President Hardesty and Carl recognized that this type of partnership would really fit well with the state's overall industrial framework. That was the kickoff of IOF-WV and now all of you in this audience are part of it.

Carl asked me to respond to breakout sessions discussions and put that in perspective of the national level. I can say is that it's tremendously exciting to see so many people engaged. Two years ago Ric Love at Century Aluminum was not a believer but now he's one of our champions.

I want to share with you some lessons we have learned that I hope you can embrace at the state level. Let me start by telling you quickly why we started this Industries of the Future process. The Office of Industrial Technologies (OIT) is an applied research and development organization. We cost-share technology in applied areas to improve energy efficiency and reduce waste. We have been around for about 20 years in one form or another and have been pretty successful. We are one of the few governmental agencies that actually keep track of what we invest in and what's successful and what isn't. In 1996, one out of every five technologies we had invested in had been ultimately commercialized. The national average is one in every ten, or at least it was at that point in 1996. We were asked how we knew those were the most important investments that we could make for the nation based on our mission. And the answer was that we did not know. We had successfully helped commercialize technologies to improve energy efficiency, reduce waste, but were they the most important for the nation? And that's when we did what many of you companies out there and universities are doing. We took a hard look at what should our core activities be. Having energy and waste as our mission, we focused on the most energy-and waste-intensive industries in the industrial sector.

As you heard from Jim Quinn this morning, there are nine industries that consume over 80 percent of the energy and produce over 90 percent of the waste. We recognized that we didn't know these industries as well as they knew their own business. So, our approach was to go out and talk to the business people in these industries and ask them where they need to be 20 years from now. What are your goals and what are the technology roadmaps that we all need to engage in to reach the goals that are important to industry and to the nation as a whole?

Most of these industries had never worked together in this way before. It's exciting because there are so many folks involved and people have really become focused rather than setting out a potpourri of different types of technologies and research that can be done. If you don't invest in the very most important things you are going to fritter your resources away and not make very much progress forward. So having said that, I really encourage you all to be enthused and excited about the types of projects you've identified last year and this year. But I would also challenge you and encourage you to step back some too. In concert with what Senator Rockefeller was saying, step back and talk about what industry in the state of West Virginia needs to be like 20-30 years from now.

I have a story that's very consistent with the Senator's comments on how industries have to change and be responsive to new technologies that are coming along. When the metal casting industry started the long-term visioning process at the national level, a group of presidents and CEOs told me they were going to incrementally improve over time. That's what they had done over the past 100 years and that's how they were going to succeed in the future. Fortunately, someone passed around a report AD Little and Company had done for the big three auto companies on how would people buy cars in the future. Chrysler, GM and Ford were saying that in the year 2004 there would be no more showrooms. People would order their cars through a virtual-reality environment where they would customize the size,

the materials, the performance of the engines. When they were happy with the "virtual car," they'd push a button to order the car and it would be delivered in two weeks. Now 2004 isn't that far around the corner and if that's the way cars are going to be ordered, all suppliers to the automobile industry really need to think about that. That report by AD Little was actually the turning point for the metal casting industry, when they decided they needed some drastic performance improvements to continue to be a supplier to the automobile industry in the future.

At the state level, I would really encourage you on an industry-by-industry basis to take advantage of what's being done on the national level. Take a look at those roadmaps. A tremendous amount of work and investment has gone into those visions and roadmaps at the national level. It's important to take advantage of what's been done at the national level, then set your own roadmaps. You don't have to fully adopt things done at the national level, but set some roadmaps so that you have targets associated with your state goals and can say in five years you have made a difference. I think that's really critical.

There is a tremendous amount of technology available nationwide that you can access. Leslie is going to talk next about Department of Commerce programs. Also, the Department of Energy has a huge laboratory system with core capabilities that could help you in your overall process, and I encourage you to think of that.

President Hardesty, in closing, I would really encourage WVU to take a leadership position in working with presidents of other land-grant universities on state-level IOF programs. As Jim Quinn mentioned this morning, we have 20-30 states that want to go down this path. Wouldn't it be wonderful to have a national consortium of universities that was ready to help deliver on these Industries of the Future activities?

I do have one last remark concerning traditional industries, and it ties in to what the Senator was talking about. Traditional industries need to really work on changing the image of that word traditional. Just because you may have been around a long time doesn't mean you are not using the newest advancements in supporting technologies such as information and materials. The sophistication you have available to optimize properties in your products is absolutely mind boggling. These new technologies are going to help you make much better decisions on how to design your materials and your processes. So I'd encourage you to say we're traditional but we're also on the forefront of technology for the world. Thank you very much.

President David Hardesty:

Thank you, Denise, for sharing your thoughts with us and for all you and the IOF team are doing to prepare traditional industries for the next century.

Our next speaker comes to the topic of federal policy from a science background. His name is Leslie Smith and he is Director of the Material Science and Engineering Laboratory at the National Institutes of Standards and Technology (NIST) in Gaitherburg, Maryland. Dr. Smith was educated at Case Institute of Technology and Catholic University, where he got his Ph.D. He joined NIST in 1969, working extensively in Polymers. He has also been involved with studies of the degradation of polyesters and investigations of the factors which

affect the durability and lifetime of magnetic storage media. He has served on a variety of committees of the Materials Research Board of the National Research Council, he advises the National Archives, NASA and many universities around the country. He has served as the U.S. editor for the International Journal of Polymers Communications. As Director of the Material Science and Engineering Laboratory of NIST he is responsible for a comprehensive program of fundamental research on measurement method standards and scientific concepts to support U.S. industrial production and use of materials. We're very happy to have him here. Would you please welcome Dr. Leslie Smith.

Dr. Leslie Smith, Director, Material Science and Engineering, NIST
(The following notes are from transparencies Dr. Smith used in his talk.)

Department of Commerce Mission Statement
The Department of Commerce promotes job creation, economic growth, sustainable development, and improved living standards for all Americans by working in partnership with business, universities, communities, and workers to:

1. Build for the future and promote U.S. competitiveness in the global marketplace, by strengthening and safeguarding the nation's economic infrastructure;
2. Keep America competitive with cutting-edge science and technology and an unrivaled information base; and,
3. Provide effective management and stewardship of our nation's resources and assets to ensure sustainable economic opportunities.

Manufacturing Extension Partnership

- A nationwide system of services and support to strengthen the global competitiveness of the 381,000 small U.S.-based manufacturing firms with 500 or fewer employees
- Network of independent, nonprofit manufacturing extension centers and field offices throughout the United States form the core of the MEP program's service and support infrastructure
- Centers provide local assess to information, decision support, and implementation assistance of client firms in adopting new, more advanced manufacturing technologies, techniques, and business best practices
- For information on the West Virginia MEP contact:

West Virginia Manufacturing Extension Partnership
Tom Mahoney, Director
317 Minerals Resources Building
Morgantown, WV 26506
(304) 293-3800
tmahone2@wvu.edu

The ATP does…

- Fund applied R&D where underlying science is known and there are clear objectives
- Insist that project proposals present a clear, coherent research plan illustrating how technical uncertainties will be tackled
- Manage awards with cooperative agreements that allow the ATP to be a partner
- Encourage companies to work together as collaborative R&D partners

Our Partners

- Small businesses are thriving
  - >50% of projects led by small businesses
  - Joint ventures have many small business participants
- Universities play a significant role
  - >125 different universities involved
  - >400 instances of participation
- Federal laboratories participate

What's New in FY 1999…

- $66 million in first-year funding leverages, $350-$450 million in R&D investment
- Technology-specific source evaluation boards
- Two selection criteria weighted equally
  Scientific and technological merit
  Broad-based economic benefits
- Continuous pre-proposal evaluation (optional)
- Large company defined by revenue of $2.721 billion

Year-round submission

- Written feedback in approximately 2 weeks
- Pre-proposals can be submitted twice
- 4 pages plus cover
- 5 questions on technical and economic merit

What We Look For in a Proposal

- Scientific and Technological Merit (50%)
  Innovations in the technology
  High technical risk & feasibility
  Quality of R&D plan
- Broad-Based Economic Benefits (50%)
  Economic benefits
  Need for ATP funding
  Pathway to economic benefit

Aerospace Casting Consortium

Technical Challenge:

- U.S. aerospace industry needs rapid, efficient, and economical production of castings
- Critical engine components can not be used unless their microstructure can be controlled within very tight limits during casting (5° misalignment between adjacent dendrites can cause rejection)

MSEL Role:

- Formed consortium of 9 partners and led research
- Developed models of local compositional changes and defect formation during solidification
- Fabricated sensor to detect the solid/liquid boundary progression
- Measured precise thermophysical data of important alloys for model
- Created sub-ppm sulfur SRM (CSTL)

Impact:

- Results incorporated in commercial software for use by process designers
- Reduces the development time and cost for design of casting processes
- Cuts the reject rate of parts by predicting the conditions which lead to grain defects
- Estimated savings from MSEL phase diagrams alone: $300 K - $600 K

On-line Polymer Processing Sensors

Technical Challenge:

- More demanding product applications result in lengthy startup times and out-of-spec products in polymer injection molding and extrusion
- Workshops identified specific measurement and control needs in polymer processing

MSEL Role:

- Research plan was adopted by MSEL-led industrial consortium
- Developed a new class of on-line sensors based on optical measurement methods for resin temperature and temperature profiles, molecular orientation, and other properties

Impacts:

Sensor and measuring technology now being used in process development by:

- 3M Co.- quality of mixing ingredients and temperature measurements
- DuPont Co.- resin temperature profiles
- Mobil Chemical Co.- molecular orientation
- Packard Electric – temperature and molecular crosslinking

WEST VIRGINIA INDUSTRY IN 2020: A STATE VIEW

Governor Cecil Underwood

Senator Mike Oliverio

Karen Price, WVMA

John Snider, WVDO

Session Moderator:
Tom Burns, Executive Director, WVDO

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SESSION SPEAKERS: *Governor Cecil Underwood; Senator Mike Oliverio; Karen Price, WVMA; John Snider, WVDO*

Carl Irwin:

We are very happy to have Tom Burns, Executive Director of the West Virginia Development Office, to kick off the second half of the afternoon session.

The WVDO is really doing something right. The job growth numbers are superb- over 10,000 new jobs created for the current year. Last year over 9,000 new jobs were generated. We are extremely grateful for what the Development Office is doing to help West Virginia progress. And I am personally very grateful for their support and involvement in the Industries of the Future program. Jeff Herholdt is my daily contact on IOF-WV matters and Jeff communicates well with others in the Development Office. They have been most supportive of what we're doing.

Tom Burns has had a very interesting career, from CEO and Director of C&P in West Virginia to managing Ameritech and Bell Atlantic-New Zealand Limited. He worked closely with the Prime Minister of New Zealand on economic development and education programs. Tom has been recognized for his outstanding contributions to various public boards and organizations. Tom was an outstanding athlete at VPI and captain of the football team during his senior year. He was awarded the VPI Williams Award as the graduating athlete with the best balance of athletic skills, scholarship, character, and leadership. And that's what Tom has done throughout his career, which I think is very admirable.

One more noteworthy recognition for Tom is that in 1991, he was the Honorary Italian of the Year. So, buon giorno, Tom, and I'd like to welcome you to the podium!

Tom Burns:

Thank you very much.

First I'd like to say how pleased I am that the Development Office has been able to participate in the Industries of the Future – West Virginia symposium. Carl and his staff have really done a super job and deserve our thanks.

I've been commenting to everybody that last year, at this meeting held in Charleston, the discussion was on "what should we do." Today the discussion is "what are we doing and what can we do more effectively." So I think we've come a long way and I compliment everybody who's involved in it.

This program does provide a process. A process we need to help modernize West Virginia's industries through the use of technology. Technology fuels industry's success, streamlining processes and improving efficiency, making them continuing partners as we go into the year 2000 and beyond.

Using on-site technical assistance, the Development Office targets priorities identified by our industries. The Development Office team is here to provide assistance wherever and whenever we can.

Technology has sparked many IOF-WV activities in the past year. Some of the things that have occurred: the hand glass industry crack-off initiative, work on developing a thin sawblade for the wood products industry, and recent efforts on addressing the corrosion in roller bearings used by the steel industry. Again, those are just a few specific things that are being accomplished.

I certainly want to compliment the breakout sessions and the recommendations that I heard earlier today. IOF-WV also combines federal, state, and private sector resources to help address long-term technology needs of our state's industries. IOF-WV fosters communication among West Virginia industries, as we're seeing here today. And I sincerely appreciate the time that each of you is putting into this effort to keep our industries viable, and I applaud the commitment of David Hardesty and WVU - I think that's great.

Our number one goal in the Development Office remains the retention, expansion, and modernization of existing industry. And the Industries of the Future Program, originated within the U.S. Department of Energy and implemented at the state level, will help us reach that goal.

Now, I'd like to ask everyone from the Development Office to stand, because before you leave this meeting today, each of you has to meet a new member of that team, and any time you need help, call that person or call me. But please, stand up, John. Everybody up! Thank you.

Today it is also my honor and privilege to introduce Governor Cecil Underwood, a man who knows the importance of technology to our state's future. His vision led to the creation of the Governor's Office of Technology which is developing statewide technology standards. You may have seen the article several days ago reporting on what the Technology Office has accomplished so far, and it's very, very impressive.

As president of the Software Valley Foundation, Governor Underwood was instrumental in the development of high-technology businesses in north-central West Virginia. And during my tenure as president of Bell Atlantic - West Virginia, I had the pleasure of serving on his board. We also established the software development company Bell Atlantic Knowledge Systems in 1986 as part of the Software Valley effort.

Now, Governor Underwood has provided outstanding leadership in support to our economic development effort, and, as Carl has indicated, we're just in the process of having our best year ever, with over 10,000 jobs--10,095 as of yesterday--and more than $1.2 billion of new investment.

Governor Underwood's leadership is crucial as we work to strengthen the backbone of our state's economy, its industries, your industries. And our speaker today looks toward the future of the state's economic success as he leads West Virginia into the 21st century, and beyond. Please welcome the Honorable Cecil H. Underwood.

Governor Cecil H. Underwood:

Thank you, Tom, for your kind introduction. And thank you for your leadership in economic development and your long list of contributions to West Virginia's future.

Carl, thank you and your associates in the Industries of the Future – West Virginia program. I am impressed with the progress the program is making and am delighted to see that so much has happened in one short year. I also want to thank the members of the Development Office staff who are present. They are a dynamic team, and we are getting accolades for their performance almost on a daily basis. Just this morning, at their repeated suggestion, I made a long-distance telephone call to the CEO of a company whom I've never met--did not know him, had no visual concepts of the person I was talking to. His company is looking at a site in West Virginia that would be a major investment with high-paying jobs. In the course of the conversation, he said, "I want you to know that the Development Office staff has been very quick to respond to all of our inquiries. They've treated us with respect and with dignity and I would have to say they are the best we've dealt with in our search for a new expansion." And I think that's extremely important. Furthermore, the overall quality of our work force is always identified as the number one attraction for expanding industries here and for new ones coming in.

And I am very pleased with the progress in using technology as a toolkit for our economic development as we move into the future. That's our goal: to use technology as a tool-kit, as the engine to drive our economic development into the 21st century, as we diversify our economic base and our geographic base for industry expansion in the state.

The traditional industries that have provided the backbone of our economic strength and heritage will continue to play a very integral role in the future economy of the state. And with the application of technology, we can make them far more productive and control the cost of productivity--the reason that technology is used anywhere and everywhere.

The Industries of the Future Program I view to be a very important element in our efforts to build a better West Virginia for the future. I certainly am pleased that the U.S. Department of Energy has recognized the vibrant role each of the traditional industries will play in our state's future. They're all retooling themselves through modernization, the use of new technologies, and commitment to quality for the very competitive global marketplace.

We are striving very hard, in addition to our efforts to market the state, to develop a government that is truly a partner of business and the people and education. We think these are all necessary components if our state is to take full advantage of the opportunity that knocks at our door every day. A great deal has been accomplished, but much more needs to be done if we are to be the competitive force that we must be. And so I salute the Industries of the Future Program and would like to identify a few other things we are doing at the state level.

First of all, we're trying, as I said, to make sure that government is a partner. We know that the only job that government can create is a government job. And we've done pretty well at that over the last several years. We also know that the policies of government and the direction of government can have a major influence--a major impact on the creation

of jobs in the private sector. Last year Dun & Bradstreet identified West Virginia as number one among all of the states in creation of new jobs relative to our population.

We're also trying to speed up the "permitting process." And I think we've made great progress there. If we could just get the Feds to do the same thing, we'd be in a great position. By speeding up the "permitting process," I am not suggesting that we are cutting corners, but that decisions need to be made on a timely basis. If you're not going to receive a permit for what you're going to do, there's no reason you should have to wait months and months to know that!

Government has great power through the regulatory process. We are trying to use the power of regulation in partnership. Wherever we find problems, we work with the people involved to solve the problem, to preserve the job and to prevent the problem be from occurring in the future.

I have had the honor to award National OSHA Safety Awards to two very hazardous industries in West Virginia this year. And that's the first time that's ever happened. In each case, the Secretary of Labor went to the location, got the full cooperation from the ownership and the management and all of the employees. Because the employees were educated on what was necessary to comply with OSHA regulations, they had a year without any violation or any accident and were able to win these national grants.

Industries of the Future concentrates, as you well know, on traditional industries very important to our state. We have developed a good working relationship with National Laboratory people who are working on projects that have a very significant relationship to West Virginia. They're doing work in metals, aluminum and steel, in chemicals and polymers, in wood products, in coal desulfurization and in many other technology efforts. What we're looking for is taking the new technologies that their new research discovers and linking our efforts with the commercialization of the new products that will come online.

Just a few years ago, Ravenswood Aluminum Company was a concern for all the state. A prolonged labor strike caused many people to wonder if the plant now called Century Aluminum would survive. Now they are a competitive force in the aluminum industry, and just last month I was there to dedicate a $35 million investment in a new rolling facility. On that day, they announced a 10-year, $400 million contract with Boeing that would not have been possible had they not made the $35 million investment. They made that investment based on their faith in the future of that plant and in the quality of the workforce that makes it productive. They also announced a similar investment in new equipment for the safety and health and working conditions of their employees. Furthermore, they announced that a new contract had been signed the day before with Lockheed-Martin. These are very significant efforts by Century Aluminum.

As you know, Weirton Steel is our number one industrial employer in West Virginia, although they've now been outstripped by Wal-Mart, in the service sector, as the largest employer in the state. Weirton Steel is working hard in cooperation with our Department of Transportation to create a modern riverport at Weirton to reduce their transportation costs and expand economic growth potential in the northern panhandle. They've been great to work with and have been cooperative in all ways. The problem now is dumping of steel from foreign countries. I was in Weirton recently with 5,000 other people on a very cold evening

for a "Stand Up for Steel" rally. They're working with our Congressional delegation and with the White House on enforcing the agreements and statutes already in place that would prevent dumping.

Weirton just announced today the closure of one of its rolling facilities and the layoff of over 400 people. We have to be able to overcome this kind of a problem. The industry has made gigantic investments to be modern, to improve its productivity, and to be in a competitive position. But to be successful, as Senator Rockefeller said, we have to compete on a level playing field - and that's the concern.

I add my congratulations to the Touchstone leadership for the announcement just made and their commitment to commercializing the WVU carbon foam. Touchstone has made tremendous strides and the people there are doing significant research and development - a very substantial contribution to our state. They do great work and are very important to our future.

The glass industry, once so important to West Virginia, has gone through almost complete transformation in the last several years. Now we see research at WVU and elsewhere on making the glass industry a significant force in our future. Two additional things are very important: Oglebay park has created a museum and marketing center for small manufacturers from all over West Virginia that are involved in glass products. The Oglebay center sells the products on a commission basis and it doesn't cost the small businesses anything to be involved in the consortium. Combined with Tamarack near Beckley, we have two excellent outlets for West Virginia glass products.

When we were in Germany this past summer, we visited the headquarters of Schott Scientific Glass. They purchased the Owens Corning plant in Parkersburg a few years ago and are now producing scientific glassware primarily for the pharmaceutical industry. They think there's a real future for this kind of glassware because it is resistant to corrosion and heat problems identified with plastic containers for pharmaceuticals and other scientific applications.

We have long been a major producer of chemicals and polymers. The chemical industry was attracted to West Virginia initially because of our low energy costs and the availability of chemical salts, particularly in the Ohio and Kanawha valleys. We have, for the most part, produced intermediates. We have not been producing very many finished products, but some important initiatives are now under way. The Polymer Alliance Zone was formed last year to search for markets and to bring polymer manufacturing companies into West Virginia. For example, our research would indicate that 85 percent of the materials used in the manufacture of outdoor sports equipment are produced in West Virginia—but none of the final products. I think that's a wide-open market, and we are now reaching out to attract finished-product, value-added manufacturing to use the chemical and polymer intermediates produced in the state.

We know that the chemical plants in West Virginia are old and have probably been fully depreciated. We know that employees are approaching retirement age and that the companies are making major decisions now for investments in the next generation of technology in the chemical/polymer industry. We are very much engaged with the corporate

leaders as their decisions are made and think it is vital that West Virginia continue to participate in the chemical/polymer market.

West Virginia's greatest natural resource is its forests. Every time I fly across the state, I never cease to be amazed at how vast our forests really are. They are our greatest natural resource, because they are renewable. If they are properly managed, they can reproduce themselves over well-known, well-defined cycles and be here forever. And so it's very important.

Historically, we have produced huge volumes of timber and shipped it away to be manufactured into final products somewhere else. Again, here is our most attractive target--to expand manufacturing of finished, value-added wood products. We are now developing several wood products incubators where we can form partnerships with government and the private sector to get wood products manufacturing located here. We think if we can succeed in that and establish a track record, there is great growth potential for the future.

We have two wood products institutes, one in the Princeton area, and one in Elkins, which are on the cutting edge (if I may use that pun) of developing wood products and technologies for the future. We are also working on the Wood Products Forestry Museum in Elkins. Much of our history is captured in the colorful West Virginia Forest Festival, and we'd like to create, in association with the Institute, a museum that shows the importance of the forest industry to West Virginia.

We are positioned now, in a way we never have been before, to take advantage of our growth, to take advantage of our high quality work force, to take advantage of commitments represented by all you people here in the room today. We have a wonderful cooperation between the governor and the Legislature. I was a member of the state Legislature in 1945 and have had a curiosity about the legislative process all of my life. I wrote my master's thesis on the legislative process in West Virginia and have studied most of the state legislatures in the U.S. I say without any hesitation that the present Legislature in Charleston is the most business-friendly Legislature in all of those 50-some years. I think our job growth every year is a result of this business-friendly environment created by the Legislature and the executive department working together and displaying a model of partnership. This builds comfort, builds confidence for people who are looking at a stable environment in any state into which they might want to expand.

So I commend all of you for your interest, your commitment, and your accomplishments in Industries of the Future and helping West Virginia companies be industry leaders in the 21st century.

Tom Burns:

Thank you, Governor, for your leadership and lifelong commitment of service to West Virginia.

I'd like now to introduce John Snider, Director of Business and Industrial Development (BID) in the WV Development Office. John has extensive experience in economic development. Earlier in his career he worked in economic development in the

Morgantown area and was president of the Morgantown Industrial and Research Park. He returned to the Development Office early last year as the head of BID. He supervises the attraction of new investment, the retention of existing industry, and the Governor's Guaranteed Workforce Program. John's participation in West Virginia's economic development team has been key to our recent successes and I compliment him for his achievements. John will lead today's panel on the subject of the state's view of West Virginia industry in the year 2020. Please welcome John Snider.

John Snider:

West Virginia Industry in 2020: A State View
(The following notes are from transparencies Mr. Snider used in his talk.)

Economic Development Trends

- Global economy
- World wide competition
- New targets: technology and knowledge based companies
- Public Private partnerships are increasingly important
- Work force development is a key factor

2020 Continuation of Trends

- Automation in production and service areas
- Higher skills for all workers
- Information technology explosion will continue

Changes in Manufacturing

- In 2020 volume of goods produced worldwide will double
- % of work force in manufacturing
  Today: 17%
  2020: 10%
- % of GDP from manufacturing
  Today: 15%
  2020: 5% to 7%
- Changes in employee preparedness for 2020

West Virginia Target Industries for 2020

- Automotive suppliers
- Chemicals
- Distribution
- Tourism
- High technology
- Pharmaceuticals
- Plastics
- Value added wood products
- Aerospace assembly
- Composite materials
- Information technology

Introduction of Senator Oliverio:

Senator Michael Oliverio is a native of Morgantown, WV. He graduated from Morgantown High School in 1981. He then went on to West Virginia University where he received a Bachelor of Science in Business Administration in 1985 and an MBA in 1996. While at WVU he was student body president and participated in the WVU Board of Advisers, the marching band, and Army ROTC. He has been a Northwestern Mutual Life insurance agent since 1988. He has served in many areas of the state government. He was on the Governor's Advisory Council for Students in 1983. He was a member of the Governor's Committee on Crime, Delinquency, and Corrections from 1985 to 1992 and chairman from 1990 to 1992. He was also a member of the Family Protection Services Board from 1990 to 1992. Senator Oliverio was a member of the House of Delegates in 1993 and 1994. He was elected to his current position in the State Senate in 1995.

Senator Mike Oliverio:

Let me give you your final welcome of the day. You've been welcomed by the governor, the senator and others – so welcome now to the 13th Senatorial district of Monongalia and Marion Counties! I'm joined today by one of my colleagues in the Legislature, Delegate Barbara Evans-Fleischauer. We're happy to have her here as well. I'm excited to be a champion for the IOF-WV program and have enjoyed working with Carl and his team. We have started meeting with other members of the Legislature to develop an interest on their part in this program.

When I ran for the West Virginia Legislature, I really ran with the idea of improving our state's economy. I remembered when – as student body president at WVU - I delivered a commencement address to 4,100 graduates and then read in the local newspaper that 72% of them would be leaving West Virginia that day. It became a compelling interest of mine to see what we could do to keep those students we had educated and invested in - many of them for 12, 16, or 20 years – in the state. Our best export cannot be our educated young people. So anything that can be done to help keep West Virginians here and to bring some of my generation back, I want to be a part of. And I believe the IOF-WV program is a unique opportunity to do that.

As I see it, this program has at least five advantages initially. First, it's a statewide initiative. So we eliminate all the parochial north-south problems, the business-labor problems, the urban vs. rural problems, and we can work together as a state on this initiative. Second, we can all applaud the goals of the IOF program - for industry to become more energy efficient, to reduce waste and to adopt new technologies. Third, I think IOF-WV forms a tremendous tie with the goals of our state's land-grant institutions: research, service, and education. Fourth, it's a perfect fit for WV. I don't know if somebody from West Virginia was involved in the U.S. Department of Energy when this program was written, but the industry sectors that were selected almost fit WV perfectly. Fifth, West Virginia has taken the leadership on the state-level IOF programs. I think we as West Virginians want to be in a position where we are leading efforts to improve the traditional industries that employed our parents and grandparents. So as West Virginians we're taking the leadership role in taking back some of these traditional industries. I think that is a real benefit to us.

So when you put all five of those things together, this is a tremendous program, and I'm real excited about it. One of the things I'm not excited about is when I see that Wal-Mart becomes our state's largest employer. Nothing against Wal-Mart and the products and services they offer, but those aren't the types of jobs that help families raise their children and provide a livable wage and the kind of benefits that people need in today's economy. We continually have announcements of telemarketing jobs. And again, those jobs can fill a niche for somebody, maybe for a short period of time, maybe for a small group of people it can be a long-range employment. But really, we as legislators and as policy makers are very interested in the types of jobs in your industries and the types of jobs you can create in your industries. Long-term sustainable jobs, sustainable economic development, is our goal in the Legislature.

As I attempt to promote IOF-WV to fellow legislators I need your help. Clearly you come from all corners of our state. You are opinion leaders in your area. You have relationships with many members of the Legislature. And I look to you to help sell this program to the state Legislature because I think the state can play an active role in promoting this program in many ways. Carl and I, along with Dave Satterfield and President Hardesty from the University, have attempted to develop some of the ways the state can play a role in this. It would be helpful in this effort for you to be talking with your local legislators about this program so that they're familiar with it when we approach them. This could be an opportunity for you to invite your legislators to your companies so they can see some of the products you are making. You can point out some of the problems your industry is encountering and how industry-wide research might be able to solve those problems and create opportunities for you. I can tell you legislators always like opportunities to visit plants and facilities where there are a lot of workers. They particularly like to do that in even numbered years in May and November. So please create those opportunities to bring others into the fold who can help us promote this initiative.

I salute your efforts and all that you are doing here to benefit West Virginia's basic manufacturing industries. It won't be easy to rethink and redo these traditional industries, but I think this is a fight we can win working together. And I want to thank you for your efforts and let you know that I stand ready. Along with Barbara and other members of the Legislature, we stand ready to help you win that fight. Thank you.

John Snider:

Thank you, Mike. Next I'd like to introduce Karen Price. Karen is a native of Charleston, West Virginia. She graduated from Morris Harvey College in Charleston with a degree in speech and political science. She served for 11 years as an industrial development representative in the Governor's Office of Community and Industrial Development before being appointed executive assistant for the Secretary of Commerce, Labor and Environmental Resources. In 1998, she was named to her present position - President of the West Virginia Manufacturers Association. Karen serves on the Governors Honors Academy Board of Directors and Foundation Board. She is a member of the Board of Directors of the Charleston YWCA and is a member of the Charleston Rotary Club. Karen, thank you for being on the panel.

Karen Price, WVMA:

Thanks, John. It's a pleasure to be here today. A lot of our members are involved in the IOF project. We in the Manufacturers Association certainly want to be part of the discussion on what's going to happen to our industries and how we can be a part of helping the manufacturing sector grow in WV.

Two years ago we asked WVU to do a study for us on the state of manufacturing in West Virginia. We wanted to know where we were and where we could go. They confirmed that we had lost a lot of manufacturing jobs over the last 15 to 20 years. And I guess the bad news on top of that was we were projected to lose more manufacturing jobs by the year 2005. So, as an association we said, "Stop, we can't have this! What can we begin to do as an organization to turn things around in this state?" Part of the answer is what's going on here at the university and we are very happy to be part of it.

The good news is that at the last WVU Outlook conference, held just about a month ago, we heard that manufacturing employment is holding steady in the state. We're not losing and we're not gaining. It is disappointing to hear that Weirton Steel is not the largest employer in the state any more and has been surpassed by Wal-Mart. Again, nothing against the service industry, but if you build the core base of manufacturing in the state, the Wal-Marts, the K-Marts and the Shoney's will all come. They'll come because the value is here and the dollars are here - manufacturing jobs pay an average of $36,000 to $37,000 a year and the average in the chemical industry is about $50,000 a year with full benefits. Those are the types of jobs that West Virginia wants to retain going into the next century. As Mike Oliverio said, we want to give our children a chance to stay in West Virginia.

The governor talked about work force development. It is a number one issue in West Virginia and there are two levels to it. The first is the aging workforce of people who will be retiring in the next ten years. I know in the Kanawha Valley the chemical industry has identified 2,500 such jobs that will be at risk. We want to create a West Virginia where we know that those companies are going to reinvest in West Virginia, where people can move up the line and we can bring young people into those plants, and not watch them as they close down production lines and move jobs to offshore operations or to Louisiana or Texas.

The second thing that we have identified is that we have some work to do on education at the primary and secondary levels, because we don't think students and teachers really understand what the economy of West Virginia is and what makes the economy grow: not just manufacturing but service, agricultural, mining and the timbering industry. We're looking at ways that we can get more involved at those levels to really begin to teach folks why we must have a diversified economy in West Virginia. We think that's really important.

Something else that's important to us as we go forward to the next century is permit issuance. We know that we have lost hundreds of millions of dollars, quite frankly, in new investment in the state because companies were not able to get their permits in a timely fashion. That is changing now; it is getting better. We need adequate funding for the state agencies that handle environmental permitting. The Manufacturers Association has been working in particular with the Office of Water Resources and the Office of Waste Management because they get very little general revenue funding. The private sector is willing to step up to the plate and pay more fees, but it's got to be a partnership. The state

must also provide more general revenue funding that's focused on the permit issuance problem.

Having started in the development office about 20 years ago, I have seen many positive changes in West Virginia and I have to give a lot of credit to the legislature. They have taken some bold steps, such as initiating reform on workers compensation that was badly needed. Is that issue solved? No, and it is not something that is going to be resolved overnight - we understand that. But we can't ignore the fact that it is a cost of doing business in West Virginia. Last night one of our member companies made a presentation to some legislators in the Beckley area. They have sister plants in Ohio and in West Virginia. Their workers compensation cost in West Virginia is about 3.2 times as much as it is in Ohio. So when companies begin to look at where there're going to put their new investment and create new jobs, they look at the cost of doing business.

There are a lot of opportunities out there, and what you're doing here with IOF-WV for the core manufacturing companies - glass, steel, chemicals, aluminum, and wood - is great. We will support that because we want to keep those industries here, grow them and make new investments. We also want to look to the future to transportation industries and to the food processing industry. They're going to grow. The polymer industry and the wood products industry are going to grow. We're working very hard on partnering with labor, government, education, and whoever is out there to help make that growth take place here in WV. I think the commitment is there from the universities, the Legislature, labor, the administration, and certainly from members of the Manufacturers Association.

I appreciate being here today. It's been a great program and I appreciate the opportunity to work with you. Thank you.

John Snider:

Thank you very much, Karen. Are there any questions for the panel?

Q: **Ron Klein**, Professor of Electrical Engineering: I just want to know what you think about transportation and West Virginia's industrial potential to be in transportation.

A: **John Snider:** You have been involved, and several other people have been involved, in that over a period of time. I think the idea of high-speed ground transportation between Clarksburg, Fairmont, Morgantown and Pittsburgh has a lot of advantages. There's a lot of synergy here on intermodal transportation. We may be several years away from that, but I think up-front planning still has to go on in order to get it started, the same way when the PRT was built.

A: **Karen Price**: Sometimes I think that we all tend not to look to the future enough and certainly this type of thinking is looking to the future and positioning ourselves. And of course what we want to do is to manufacture new transportation systems. I think it is a terrific idea.

Q: Will consolidated currencies such as the Eurodollar affect West Virginia exports and investments?

A: **John Snider:** There is a possibility that in the future we could end up with not only a Eurodollar, but also a North American dollar. We haven't been that far from the Canadian dollar over the past few years. And you may see a Far East dollar, Yen or whatever. With more and more international trading, you could see currencies consolidate over the coming decades.

Tom Burns: John, I'd like to add to what you said. From my experience internationally, I don't see any real problem with this over a period of time. I think John's correct that there will be more changes in the future than there have been in the past. But in my opinion, and some of you from industry need to comment on this, from where we sit in the development office we don't see this as a big issue. We deal in currencies from all over the world and it seems to work effectively, although sometimes slowly.

Carl Irwin:

Thank you, Tom and thank you, Karen, John and Mike. We very much appreciate all of your comments and look forward to continuing to work with you.

IOF-WV is not a one-institution, a one-company or a one-person thing. I hope that we can continue to develop cooperative teams in these industry sectors. In addition, there's the whole area of cross-cut technologies – cross-cut industries we have in West Virginia such as power generation and carbon products - that affect all the IOF-WV core industries. We would like to continue developing the overall program, but it's a day to day thing. It has to happen throughout the year not just once a year in December.

Thank you very much. Let's continue our discussions at dinner tonight. There is a reception sponsored by the Appalachian Hardwood Center prior to dinner at the Erickson Alumni Center.

DUMPING, GLOBAL COMPETITIVENESS, AND IOF-WV:

Paul L. Joffe, Wiley, Rein and Fielding

Following the symposium dinner, Paul Joffe spoke on "Dumping, Global Competitiveness, and IOF-WV." Joffe discussed relationships between international trade rules, technical and engineering programs, and remedies for dumping. He discussed examples from both importing and exporting, relating to industries such as steel, chemicals, and wood products. For example, industry research and development programs and efforts to modernize can be a factor in winning trade relief under some U.S. trade laws. He also discussed efforts to reduce unnecessary burdens and inconsistencies in U.S. and European Union rules relating to the environmental impact of chemical industry research and development. In another case, inconsistencies in rules led to controversy regarding efforts to prevent insect infestation of wood packing materials used in shipping goods in international trade. Paul concluded by stressing the importance of understanding and close cooperation among technical experts, managers, and lawyers in dealing with international trade issues.

SHORT COURSES
AND
WORK SESSIONS

A-1 Lean Manufacturing
B-1 Strategies for Benefiting from a Competitive Electric Market
C-1 Tutorial on Writing NICE^3 Proposals

A-2 Financing Process Improvements through Performance Contracting
B-2 Energy, Waste, and Productivity Enhancements that Reduce Manufacturing Costs for IOF-WV Companies
C-2 Organizational Meeting of WV Mining Industry Group

A-3 Recent Trends in Scheduling

SHORT COURSES AND WORK SESSIONS:

A-1 Lean Manufacturing
Organized and presented by David Lieving, WVDO

"Lean Manufacturing" is also known as the Toyota Production System, Just-In-Time (JIT) Manufacturing, and Demand Flow Technology. At the center of lean manufacturing practices are concepts of making products to customer order (pull), very small production lot sizes, and short production cycle times, coupled with a multi-skilled workforce employing Continuous Improvement Methods to improve quality. The workshop gave the attendees an opportunity to hear how two West Virginia firms (Walker Systems of Williamstown, and Royal Vendors of Kearneysville) are currently practicing lean manufacturing.

B-1 Strategies for Benefiting from a Competitive Electric Market
Presented by the WVU Electric Industry Research Group (M. Choudhry, S. Douglas, D. Greenstreet, R. Klein, T. Torries, T. Witt)

The electric industry in the U.S. is going through restructuring to unbundled generation, transmission, and distribution functions. Twelve states have now passed legislation to provide customer choice at the retail level, and a number of other states are considering legislation for retail customer choice. The WVU Electric Industry Research Group presented an overview of electric industry deregulation efforts at the state and federal level. The Public Service Commission of West Virginia has held taskforce meetings and public hearings throughout the past year to determine if deregulation is in the public interest, and if so, to develop a workable plan for deregulation of the electric industry in West Virginia. The short course covered issues that need to be resolved to achieve a workable deregulation plan in West Virginia. The role of distributed generation for industrial customers in a restructured electric market was also discussed. Parallels in other industries that have recently been deregulated, such as telecommunications, natural gas and airlines, were also reviewed.

C-1 Tutorial on Writing NICE^3 Proposals
Organized and presented by B. Gopalakrishnan, WVU; Judith Dyer, WVDO; and Lisa Barnett, U.S. DOE

The U.S. Department of Energy sponsors the National Industrial Competitiveness through Energy, Environment, Economics (NICE^3) for the industrial sector. NICE^3 is an innovative cost-sharing program to promote energy efficiency, environmental improvements and economic competitiveness. The grant program provides funding to state/industry partnerships to demonstrate advances in energy efficiency and environmental technologies. Topics discussed included eligibility, pre-proposals, tips for writing a winning proposal and the timeline for the next funding cycle. Your company can save money and be a leader in demonstrating new energy efficiency and environmental technologies by participating in NICE^3.

A-2 Financing Process Improvements through Performance Contracting
Organized by Jeff Herholdt, WVDO
Presented by EPS Capital Corporation of Doylestown, Pennsylvania; and HEC Corporation of Charleston, West Virginia

Performance Contracting is a relatively new method of financing industrial process and/or building improvements. In Performance Contracting, anticipated cost savings associated with a process improvement are used to finance the cost of that improvement. For example, schools are using anticipated energy savings to finance new heating, ventilation, and lighting systems. In industry, a performance contractor would finance a process improvement at a business and receive payments equal to the annual cost savings the improvement yields. Short course presenters were EPS Capital Corporation of Doylestown, PA, and HEC Corporation of Charleston, WV. Examples of specific performance contracts implemented with industrial process customers were given. Specific issues such as how the contracts were financed and structured were also covered.

Overheads :

Energy Performance Contracting

A service which provides "turnkey" implementation of energy efficiency, conservation and cost reduction measures Energy Savings Projects to end-use facilities and utilities on a "Paid-From-Savings" basis.

Definition of: Energy Services Company (ESCO)

- Develops and implements Energy Savings Projects on a "turn-key" basis
- Risks payments for its services on the performance of the equipment/services implemented

How an ESCO Works

- Markets to end-use facility owners
- Develops Energy Savings Projects on a "risk" basis
- Arranges/provides project financing
- Negotiates energy services agreement with facility owners
- Designs/builds project
- Provides long-term guarantees and operational services

ESCO Services Offered

- Conduct Feasibility Analysis
- Structure "Paid-From-Savings" Program
- Access Outside Funding Opportunities
- Obtain/Arrange Financing
- Provide Engineering Design
- Provide Construction Management
- Purchase & Install Equipment
- Guarantee Project Performance*
- Monitor/Manage Project Performance*
- Maintain ECRMs*

- Provide Training*
- Provide Administrative Services*

*For Up to 25 Years

Typical ESCO Project

Assuming a $1 million project, the projected annual cash flow and debt coverage ration for typical project is as follows:

Construction Price to ESCO	$1,000,000
Construction Interest (12 mths)	50,000
TOTAL AMOUNT FINANCED:	**$1,050,000**
Annual Savings	250,000
Debt Services – 10 years @ 10% on $1,050,000	167,000
CASH AVAILABLE TO SHARE	**$83,000**

100% DEBT FINANCED

Comprehensive Industrial Focus Energy Systems Integration

- Process combustion furnace optimization
- By-product fuel/gas utilization
- Efficiency upgrades for large pumping, fan and compressed air systems
- Central steam/power plant and steam utilization upgrades
- Centralized industrial energy management and monitoring systems
- Heat recovery
- Lighting and HVAC controls

What is Performance Contracting?

Performance Contracting is a turnkey retrofit process which includes all energy analyses, design engineering, equipment, installation, commissioning, monitoring, and savings guarantees. Various financing packages can be offered to provide for positive cash flow.

Performance Contracting: Process

Consists of five distinct steps:

- Utility data analysis
- Walk-through energy audit
- In-depth engineering study
- Design/Construction
- Savings assurance services

Performance Contracting: Utility Data Analysis

- Statistical Analysis only
- Utility bills, facility square footage
- Determine annual Btu/SF
- Compare to other similar facilities
- Estimate conservation potential on basis of an acceptable payback period

Performance Contracting: Walk-through energy audit

- Usually one day visit
  - 75% Interview
  - 25% Walk-through
- Define systems and operating practices
- Identifies potential energy conservation measures
- Verifies results of Utility Data Analysis

Performance Contracting: In-depth Engineering Study

- Establishes fixed scope
- Establishes fixed cost
- Establishes savings guarantee
- Defines savings verification methodologies
- Quantifies any applicable utility rebates

Performance Contracting: Design/Construction

- Monthly Management Meetings
- Updates schedules
- Establishes savings stream
- Manages subcontractors
- Coordinates all work
- Documents all activities
- Training

Performance Contracting: Savings Assurance

- Ongoing training
- EMS monitoring
- Monthly site visits
- Utility bill review
- Annual reconciliation

Performance Contracting: Scope of projects

- Boiler Plant Optimization
- Chilled Water Optimization
- AHU Modifications
- Temperature Control Improvements

- Electrical Systems
- Envelope
- Anything that saves energy

Performance Contracting: Sample Cash Flow Analysis

In-Depth Engineering Study:	$25,000
Design/Construction:	$500,000
Construction Term Interest:	$20,519
Total Lease Amount:	$545,519
Seven Year Lease	
7% Interest Rate	
Savings Assurance Cost:	$35,000
Guaranteed Annual Savings:	$175,000

B-2 Energy, Waste, and Productivity Enhancements that Reduce Manufacturing Costs for IOF-WV Companies

Presented by the WVU Industrial Assessment Center (R. Plummer, B. Gopalakrishnan, K.V.K. Ganesh Iyer, S. Sithamraju, and K. Craig)

The purpose of the short course was to provide information to engineers on energy conservation and management, waste management, and productivity improvements in manufacturing plants. The course introduced the basics of energy assessment and conservation in manufacturing plants, focusing on topics such as electrical motors, compressors, heat generating equipment, lighting, waste recovery, power factor, boilers, and insulation. Various Energy Conservation Opportunities (ECOs) were discussed. Waste management techniques related to water, paper, pallets and hazardous wastes were discussed. Productivity improvement techniques were also discussed, enabling practicing engineers to try implementation at their plants.

C-2 Organizational Meeting of WV Mining Industry Group

Toni Marechaux of the OIT briefly described the national IOF Mining program. General technology focus areas are in exploration, mining, and processing. The first of several more detailed technology roadmaps will be available in March 1999. Two solicitations will be out in 1999 for a total of $2 million requiring 50% industry cost-share. Proposed projects should include at least two companies – the more partners the better - and technologies should be applicable to both hardrock and coal mining.

Syd Peng of WVU summarized research priority topics of the WV Coal and Energy Research Bureau – mountaintop mining, global warming, mine roof stability, and respirable dust.

Session Attendees:

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Jim Dean	Toni Marechaux	Tom Rubenstein
Lloyd English	Michael McMillion	Kurt Sisson
David Greenstreet	Martha Moore	Tom Torries
Carl Irwin	Fellicia Peng	David Yang
Greg Kawalkin	Syd Peng	
A. Wahab Khair	Bill Pollock	

A-3 Recent Trends in Scheduling
Presented by Merle Thomas Jr., WVU Industrial Extension

IOF attendees learned how recent scheduling techniques help manufacturers work smarter, not harder. Novel production scheduling advances can yield significant increases in manufacturing efficiency.

The seminar covered recent developments in planning and scheduling software, such as:

- Material Requirement Planning
- Critical Path Method
- Capacity Oriented Materials Management
- Just In Time (Zero Inventories)
- Process Flow Scheduling
- Production Optimization (Linear Programming and Operations Research)
- Production Simulation

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