

**Mining and Reclamation Technology Symposium
Federal Energy Technology Center
Morgantown, West Virginia
June 23 and 24, 1999**

[Final Participants List](#)

Wednesday June 23, 1999

Dr. Jan Wachter, Federal Energy Technology Center Director, Environmental, Safety and Health Division, welcomed a total of 98 participants representing the state and federal regulatory community, coal mining industry, industry consultants, and environmental interest groups. Dr. Wachter introduced Dr. Paul Ziemkiewicz, Director, National Mine Land Reclamation Center, who served as the symposium facilitator throughout the two-day proceedings.

Dr. Ziemkiewicz highlighted the scope and purpose of the symposium. The Mining and Reclamation Technology Symposium was commissioned by the Mountaintop Removal Mining/Valley Fill Environmental Impact Statement (EIS) Interagency Steering Committee as an educational forum for the members of the regulatory community who will participate in the development of the EIS. The Steering Committee sought a balanced audience to ensure the input to the regulatory community reflected the range of perspectives on this complicated and emotional issue. The focus of this symposium is on mining and reclamation technology alternatives, which is one of eleven topics scheduled for review to support development of the EIS. Others include hydrologic, environmental, ecological, and socio-economic issues.

Overall Purpose of the Symposium in Relevance to the EIS

Mr. Mike Robinson, Chief, Program Support Division, Appalachian Regional Coordination Center, Office of Surface Mining, Reclamation, and Enforcement provided the background of the Mountaintop Mining/Valley Fill EIS including the 1998 legal settlement that required the EIS to be completed within two years. He identified the current concerns about the practice of mountaintop removal mining, why the EIS is being conducted, and what will be studied. His briefing includes geographic information system (GIS) views of the existing valley fill areas throughout West Virginia, Kentucky, Virginia, and Tennessee, which are the only areas of the United States known to be suitable for the mountaintop mining technique and, therefore, expected to need valley fills to receive the excess spoil material. Members of the EIS Steering Committee include, Mr. Robinson, Office of Surface Mining; Ms. Rebecca Hanmer, U.S. EPA; Mr. Rodney Woods, U.S. Army Corps of Engineers; Mr. Dave Densmore, U.S. Fish & Wildlife Service; and Mr. Charley Stover, West Virginia Division of Environmental Protection.

[Mountaintop Mining Environmental Impact Statement](#)

Mining Primer: A General Description of Various Mining Techniques

Mr. Stanley Suboleski, Head, Department of Mining and Minerals Engineering, Virginia Polytechnic Institute and State University, provided the overview presentation on mining methods suitable for steep slope terrain. He identified four major methods and two niche methods and discussed the basic economic and physical factors that determine where each is likely to be employed. The two major surface methods are mountaintop mining and contour/point mining and the two major underground methods are room and pillar and longwall mining. He cited auger and highwall mining as surface related niche methods. His presentation included figures on the amount of surface mining that is conducted in the United States and the southern Appalachian region. He also discussed the capital expenditures, coal reserves, and other factors necessary for a particular mining method to be economically viable. The percentage of reserve area recovered by the various surface methods ranges from approximately 33% for single augers to 100% for areas mined by mountaintop removal. Coal recovery for underground methods range from approximately 40% for room and pillar operations to 80% overall for longwall mines. Both longwall and mountaintop removal methods require large capital expenditures which necessitate larger reserve areas for a mine to be

economically feasible.

The speakers following Mr. Suboleski provide more detail on the surface mining techniques. Mr. Suboleski prepared a presentation detailing underground methods, which is included in this proceedings, but the presentation was not given during the symposium in an effort to make up time.

[Overview of Mining Methods](#) [Underground Mining Methods](#)

Surface Mining- Loader/Truck and Shovel/Truck Methods

Mr. Tom Meikle; Progress Coal Company
Mr. Kermit E. Fincham, Jr., Elk Run Coal Company, Inc.

Mr. Meikle described the mountaintop removal and contour/point methods of surface coal mining using a case study example. The case study served to highlight the decision making process that industry typically uses to evaluate the economic feasibility of a prospective surface mining operation. He highlighted that most of the low ratio (ratio of total overburden to recoverable clean coal) coal reserves in Appalachia have been extracted and the higher ratio reserves that remain will require more capital to extract. The typical mountaintop removal operation removes multiple seams of coal, often eight down to the Coalburg seam, removing an average of 436 vertical feet of terrain. Mr. Meikle was joined by Mr. Kermit Fincham who presented the detailed reserve evaluation that is conducted to assess the value and features of the coal reserve that will drive the overall mining operation. Mr. Meikle continued with the remaining activities that are considered in the feasibility analysis through final reclamation and the results of his case study. His case study concluded that this typical operation had an internal rate of return of 9.6% (net present value), which he remarked makes the project only marginally feasible. Furthermore, he concluded that the low rate of return is further impacted by uncertainty in environmental regulations that is further discouraging the large capital investments necessary to conduct these operations.

[Truck and Shovel Methods](#)

Surface Mining- Dragline Method

Mr. Peter Lawson, Arch Coal, Inc.

Mr. Lawson reviewed the history of dragline operations dating back to 1904 and development of the Chicago canal. Today, only two firms continue to manufacture large draglines, including P&H Mining Equipment and Bucyrus Erie. Dragline equipment has grown in capacity to 118 cubic yards (bucket size) and typically operated on the overburden leading to extraction of the lowest seams. Draglines are not appropriate for all surface mining operations and, like other methods, are evaluated on the basis of several factors. He highlighted several benefits of large area surface mines including reclamation of legacy Acid Mine Land (AML) sites within the operating area, elimination of miles of pre-SMCRA highwalls, elimination of underground fires, and creation of wetlands and passive water treatment sites.

Those interested in receiving a copy of Mr. Lawson's presentation should contact him directly at:

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Surface Mining- Conventional Auger and Highwall Miner Methods

Mr. Ian Carr, AEI Resources

Mr. Carr presented the results of his international research into state-of-the-art auger and highwall mining technology. These technologies are used to increase the recovery of coal underneath a highwall for a depth of several hundred to a thousand or more feet after continued removal of the highwall becomes uneconomical. Single, double, and triple augers typically have a lower coal recovery rate than highwall miner technologies, but highwall miner technologies require a higher capital investment. Mr. Carr's presentation featured auger technologies from Salem Tool, and Brydet and highwall systems from Arch Technologies (Archveyor), Superior- Highwall Miners, and ADDCAR Highwall Mining Systems.

[Auger and Highwall Miner](#)

Environmentally Responsible Options in Mining

Mr. John Morgan, Morgan Worldwide Consultants

Mr. Morgan is one of three experts retained by the EPA for the Plaintiffs as a result of the settlement suit to support the EIS. Calling his presentation "From Perception to Procedures," he focused on the public participation process and encouraged the mining industry to engage the affected local public on key issues earlier in the process and more effectively for a more successful outcome. He cited key issues as mitigation of short-term effects (dust, noise, blasting, traffic, etc.), Approximate Original Contour (AOC), AOC variances and post-mining land use, and minimization of areas disturbed by mining. He noted the need for a "rational approach" to determining optimum mine configuration and recommended the concept of "banking" to aid in matching optimum fill capacity to excess spoil.

[From Perception to Procedures](#)

Outlook for U.S. Coal Markets through 2020

Ms. Mary Hutzler, Director, Office of Integrated Analysis and Forecasting, Energy Information Administration (EIA)

Ms. Hutzler presented the government's long-range forecast for coal extraction and economics. EIA's congressionally mandated mission is to develop independent energy data and analyses that help enhance the understanding of energy issues on the part of business, government, and the general public. The EIA has similar forecasts for other fuels. She cited the recent dip in coal prices as a result of an oversupply of fuels, particularly foreign oil, and a resulting underdemand for coal. For the long-term, the EIA projects a shift to natural gas combined cycle energy technology as the nation retires more than forty percent of the nuclear energy production capacity. Electricity rates overall will decline about one percent per year through 2020 due to electric utility industry restructuring and retail competition. EIA also projects a continuing decline in minemouth coal prices through 2020 due to projected coal extraction productivity increases of 2.3 percent per year and increased production of western coal reserves, at a lower cost, compared to eastern coal reserves. If Congress chooses to ratify the Kyoto Accord, the fraction of energy produced from coal will decline from fifty percent to near twenty percent with associated declines in coal employment from 80,000 to 29,000.

[Outlook for U.S. Coal Markets through 2020](#)

Panel Discussion: The Future of Surface Coal Mining

Nirmal Gangotadhyay, New Land Leasing Company; Ben Greene, WV Mining and Reclamation Association; John Morgan, Morgan Worldwide Consultants; Barry Doss, Addington Enterprises, Inc.; Tim Backus, P&H Mining Equipment

Mr. Gangotadhyay highlighted that fact that the costs of extracting coal and obtaining permits have continued to increase, while the methods have remained essentially unchanged. The regulatory issue is

complicated by the several agencies trying to simultaneously regulate the industry and the continuing debate regarding AOC nearly 25 years after the passage of SMCRA. He noted that valley fills in place for several years have not affected downstream water quality and expressed concern that the Judicial Branch of government was exerting undue control over the mining industry.

Mr. Greene focused on the shortcomings of long-range predictions like those presented by the EIA and suggested that unexpected events like the oil embargo in the 1970's have always had a positive effect on the coal industry. Large equipment has come to West Virginia increasing the total coal production with record levels in 1998. He suggested that the industry choose the "keep at it" approach and not be discouraged or dissuaded by long-range forecasts. Mr. Green also suggested the Steering Committee rethink the value of reclaiming these large areas with forestry operations.

Mr. Morgan made the point that the productivity increases projected by the EIA may not be achievable considering the declining grade of the reserve base (more difficult to extract). Western reserves are more competitive, therefore drawing the available mining capital away from West Virginia. He cited the European movement away from coal and oil to natural gas as an additional threat to the demand for coal. Reduction in mining will make retaining a qualified labor force more difficult - particularly as mining methods become more sophisticated.

Mr. Doss made a brief presentation to the audience on the coal operator perspective. He projected that existing operations will be mined to depletion within the next ten years. Due to the difficulty in obtaining a permit and the affect on available capital, there will be a reduction in new mountaintop removal permit applications. He expects to see an increase in the use of multi-method mining or hybrid operations where a number of different mining methods are used on the same site. He also noted that re-mining in marginal, previously mined areas could increase. He does not expect to see further increases in the size of large equipment, but he does believe manufacturers will meet the changing market with improvements in technology, productivity, and efficiency - particularly in the areas of fuel efficiency and digital and control technology. He cited the positive effects of large area mining including affects on employment and economics and the lack of evidence of environmental impact from existing valley fills.

[Future of Surface Coal Mining; Mr. Doss](#)

Mr. Backus noted the larger trucks and shovels and the effect they have had on productivity. Truck sizes have grown as large as 360 tons and are limited by the state of tire technology. Shovel size will follow increases in truck size. Large dragline operations are limited by maintenance and downtime costs. He projected slow growth in eastern mining operations, and expects the main growth for equipment manufacturers to come from overseas operations. Lower prices for all fuels and the potential for lower profit margins will drive the need for larger, more efficient mining equipment.

The panel received questions from the audience. A member of the audience asked the panel members to respond to the specific projections and ideas offered by Mr. Doss and Mr. Backus. Panel members cited the need to reduce uncertainty and delays before companies will invest in eastern coal, and noted the apparent large discrepancy between the values cited for coal reserves and mineable coal. Considering the earlier presentation by Mr. Meikle, a member of the audience asked what is an acceptable rate of return and what improvements in mountaintop mining will be necessary to make up the difference (will increased permitting efficiency be sufficient). The panel thought that a rate of return closer to 12 to 15 percent with some reduction in the level of risk would be necessary to attract new capital. Some capital investments are already committed and are subject to whatever rates are available but are loosing money.

Mr. Meikle, speaking from the audience pointed out there is a direct relationship between risk and return. The uncertainty over costs and risk has most capital frozen making it impossible to determine the extent of mineable reserves.

Another member of the audience, identifying himself as a member of the UMWA and the West Virginia Legislature, asked why the mountaintop removal mining has become such a problem now? Mr. Morgan pointed out that the size of mountaintop removal operations has continued to increase. The size of the Arch Coal permit in 1998 was only the catalyst to question the practice.

Mr. Jim Kotcon posed a hypothetical scenario and asked which equipment would provide a reasonable economic return while minimizing the impacts to the environment. What specific technologies are selected for mountaintop mining and how does the industry convince nearby residents of their choices? The panel pointed out that every selection is site specific according to the factors considered in the mining plan and available equipment and capital. There is no unique guidebook. The panel also noted that every member of the community has a different agenda in the permitting process and it is not easy to please everyone who is affected. It was noted that the case study to be presented on the second day would address the question of mining method and equipment options.

The panel was asked to address the 500 acre bank and highgrading as they are related to the 250 acre threshold. Mr. Morgan noted that the 500 acre figure was just an example. The issue is whether the calculations on the optimum configuration indicate that valley fills are required. Mr. Morgan recommended a review of the 250 acres threshold because, in many instances, fewer larger fills would be easier to justify with an expected lower cumulative impact on the environment. Mr. Doss noted that the current regulations encourage companies to design more, smaller valley fills for a given mine site to avoid the 250 acre threshold. Mr. Morgan agreed and noted that this situation supports the concept of an optimum configuration and "banking," which could allow more flexibility while minimizing impacts. Mr. Greene noted that the 250 acre threshold arose from a legal ruling, and has little scientific or technical basis.

Mr. Doss highlighted the uncertainty regarding the issue of post-mining land use as a significant barrier in the permitting process. There is little additional cost to the mining company to develop the site to any of the various post-mining land uses. However, they need some stability in the process. He also emphasized the positive benefits of large area mining. The large area operation in Cabin Creek covered an estimated 5,000 acres and reclaimed an estimated 745 acres of land adversely impacted by previous mining practices.

Closing Remarks- Day 1

Dr. Paul Ziemkiewicz, Director, National Mine Land Reclamation Center

Dr. Ziemkiewicz provided four summary points from the first day of the proceedings:

- Coal mining in West Virginia is likely to continue.
- Many of the sites under consideration for mountaintop removal operations have been previously mined and are environmentally degraded.
- Previous mining has also high-graded the coal reserve making it more difficult to economically extract.
- The industry needs stability in both economic and regulatory issues to continue to operate. This need should be considered when determining which elements will be addressed during the EIS process.

Thursday, June 24, 1999

West Virginia Approximate Original Contour (AOC) Concept

Mr. Jim Pierce, West Virginia Division of Environmental Protection

Mr. Pierce is member of the five-agency team that drafted a guidance document for evaluating the AOC concept found in SMCRA and WVSMCRA. SMCRA requires that the final surface configuration, after backfilling and grading, closely resemble the general surface configuration of the land prior to mining while maintaining the necessary flexibility to accommodate site-specific conditions. The draft guidance document provides an objective and systematic process for achieving AOC on steep-slope surface mine operations while providing a means for determining excess spoil quantities. Using this process maximizes the amount of mine spoil returned to the mined area while minimizing the amount of spoil placed in excess spoil disposal

sites, e.g., valley fills. This, in turn, minimizes impacts to aquatic and terrestrial habitats through ensuring compliance with environmental performance standards imposed by WVSMCRA.

Comments from the audience expressed concern over the poor definition of “higher and better” land use necessary to obtain an AOC variance. The resulting uncertainty in the AOC variance rule eliminates the economic profitability of many sites. This could, in turn, raise the cost to the state of taking claims if landowners become involved.

[Mountaintop Reclamation: AOC and Excess Spoil Determination](#)

Landform Grading and Revegetation: A Concept for Mined Land Reclamation

Mr. Horst J. Schor, H.J. Schor Consulting

Mr. Schor pointed out that southern California and other areas have been dealing with reclamation issues similar to those in West Virginia concerning the practice of mountaintop mining. In southern California the issue arises when dealing with urban pressure to develop hillside terrain for residential development. In other areas the issue arises during post mining reclamation. Through his practice of civil engineering he has studied, categorized, and emphasized the use of natural landscape analogues in reclamation grading and revegetation. He highlights that natural terrain does not slope uniformly at a 2:1 gradient but consists of repetitive vertical curvilinear features that are more visually appealing. Furthermore, natural vegetation patterns are not uniform but are concentrated where water flow concentrates in swales. From his experience, he noted that grading contractors are very capable of reforming the land in a more natural configuration with a project cost increase of not more than two percent and little increase in the excess spoil area.

Schor published material - [Article 1](#), [Article 2](#), [Article 3](#), [Article 4](#)

Panel Discussion: AOC and Landforms Necessary to Accommodate Various Post Mining Land-Uses

Mr. Horst J. Schor, H.J. Schor Consulting; Dan Cox, Massey Coal Services; Jim Pierce, WV Division of Environmental Protection; Mike Castle, Office of Surface Mining

The panel began by taking questions from the audience. One member of the audience asked about the establishment of meandering streams in Mr. Schor’s scheme. Mr. Schor indicated that in his experience streams could be reestablished in nearly the same channel with little settlement. The fills are engineered and constructed with large rock underdrains and slate or sandstone channels to provide stability. Mr. Cox pointed out that there is nothing in Mr. Schor’s concept that cannot be accomplished at existing sites by industry- the issue will be cost. Mr. Pierce noted that the draft AOC guidance was flexible enough to accommodate natural landform grading and revegetation. However, Mr. Castle stated that some regulatory issues might exist with respect to fill saturation and maintenance of the phreatic surface to ensure stability.

The panel debated the issue of higher and lower landforms that has been cited as a regulatory impediment to permitting. Mr. Cox cited this as the biggest problem faced by the coal mining industry today. He also stated that, in his opinion, flat property is more valuable in West Virginia than regulators might believe.

A member of the audience asked for the basis for the 250 acres threshold for the size of valley fills requiring a variance and the kinds of impacts that are expected at that threshold. Mr. Castle pointed out that the 250-acre limit is an interim value until completion of the EIS.

In response to a question from the audience, Mr. Schor noted that reclamation to more natural landforms contribute to the re-establishment of natural habitat and introduction of native species.

Ms. Hanmer, speaking from the audience, noted that West Virginia has developed a Watershed Framework Document and asked how this framework was being used to address the issue of mountaintop mining and

post-mining land use? The panel pointed out that the state has established a Coalfield Development Office that should be the focus of a watershed approach to this issue.

With respect to Mr. Schor's approach for natural landforms, Mr. Hartos noted that valley fills shaped with natural landforms would probably cover more area than valley fills shaped in the traditional form. The question was posed as to how the natural landform approach maintains the stability of streams. Mr. Schor noted that reconstructed streams in natural landforms are engineered with high compaction and sandstone channels. The entire natural landform fill is also constructed with an underdrain for geotechnical stability, as are current valley fills.

Mr. Doss asked how the current draft of the AOC rule would allow the use of natural landforms. Mr. Pierce answered that the model was not yet finalized but that nothing specifically precluded alternate landforms with an approved variance. Mr. Woods of the US Army Corps of Engineers commented that the stream impact mitigation ruling that they are required to enforce allows only the minimal amount of fill to affect existing streams. Ms. Hanmer commented that the EPA position is not as rigid. Their point of view considers what the permitted firm has done to prevent, mitigate, restore, or reclaim the watershed to an equivalent aquatic value. According to Ms. Hanmer, the EPA has identified the need for study of paired watersheds with and without fills in an attempt to discern the potential impact on value of the watershed. Mr. Ziemkiewicz noted that the recent SAIC study presented to the Surface Mining Task Force, which evaluated the health of channels downstream of valley fills, is neutral with respect to the impact of the fill. However, the SAIC study was small in scope and contains insufficient data to be conclusive on the subject. Mr. Sweeney pointed out that the Programmatic EIS that the EPA has undertaken on this mining practice would pick up where the SAIC study left off.

As a closing remark of this session, Mr. Meikle made the comment that, in his opinion, the WVDEP surface mining permitting capability is shutdown until the OSM and EPA resolve the post-mining land use issues that have been raised during this symposium. Another individual added that mine permitting has been stopped without evidence that anything negative is or has occurred. Why has it stopped? Mr. Robinson rebutted that permitting has not stopped. The settlement included two parts, one to evaluate the effects of the practice and the other to address the permitting process.

Presentation of a West Virginia Case Study

John McDaniel Arch Coal, Inc.; Eugene Kitts, Summit Engineering

Mr. McDaniel and Mr. Kitts presented an extensive and detailed case study reflecting the development of a detailed mine plan in preparation for permit application. The case study was based on the development of an actual permit request and was very useful in understanding the breadth and depth of issues that a mining firm has to evaluate and make decisions about in order to determine economic feasibility of extracting coal from a reserve. The briefing material covers the breadth of the presentation and the buildup of the economic evaluation.

[West Virginia Case Study briefing materials](#)

Panel Discussion: West Virginia Case Study

John McDaniel, Arch Coal, Inc.; John Morgan, Morgan Worldwide Consultants; Anthony Szwilski, Marshall University

Mr. Hartos opened the questioning by asking how many community interactions typically occur for the determination of post mining land use. Mr. McDaniel commented first by noting that little interaction occurs because at this point the mining firm is trying to ascertain the economic viability of the project before engaging regulators and the public. Mr. Morgan made the point that too much advanced planning before

engaging the public actually creates a barrier to approval. His position is that creating an early public dialogue will enhance the participation and support of the public in the permitting process.

Mr. Szwilski presented the point of view that the mining firms would benefit from implementing an ISO 14000 Environmental Management System. This system of environmental self-management would generate a renewed confidence in those members of the industry that adhere to it. The motivation for a firm to adhere is largely intangible but adherence might serve to streamline the permitting process for those firms that are certified.

Mr. McDaniel responded to a question about environmental analyses conducted during the preliminary mine planning phase by stating that a large amount of environmental data is collected by professional scientists as part of the baseline assessment. This data is available for additional study of post-mining and valley fill environmental impacts.

Mr. Morgan commented that uncertainty and delay in acquiring permits largely drive the cost and the marginal economic viability of mining in West Virginia. The notable exception to this generality is the direct cost to achieve AOC. Anything that can be done to establish a dialogue with the public and regulators early in the process would be helpful.

Closing Remarks

Dr. Paul Ziemkiewicz, Director, National Mine Land Reclamation Center

Mr. Ziemkiewicz closed the conference by providing a conclusion based on his perspective as facilitator. He noted that West Virginia underwent a mining boom in the 1980's. Mines during this period were typically small, undercapitalized and left environmental and economic issues to resolve after closure. Additionally, these small mines served to high-grade the reserve making the remaining coal less viable to recover. Large consolidated mining operations in the area of these small mines would have the combined benefit of improving the economics of the remaining reserve and provide long-term stability for contracts, labor, planning, and other factors. These bigger operations will be easier to regulate than many small operations and will have a big effect on reclaiming previously mined areas.

He pointed out that clarity in regulation is necessary to attract mining capital back to West Virginia. The AOC policy must be coherent and post mining land use policy must be clear. In some instances growing trees may be preferable to further economic development. He also recommended a holistic watershed approach to hydrologic protection and reconstruction. Reconstructed streams and natural landform grading fit well with a watershed approach and should be considered as part of the solution.