

## 2003 VA Tech Energy Education Program Coal to Electricity

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### INTRODUCTION

The 2003 VA Tech Energy Education Program, *Coal to Electricity* concluded July 25 with another enthusiastic and more knowledgeable group of Virginia science teachers. The seventh annual education program for Virginia science teachers in grades 3-12 provided instruction and first hand experiences about energy, electricity, Virginia's natural resources, economics, and environmental topics related to mining of coal and the production of electricity through coal fired generation. The program was supported by direct funding from partnerships with ten (10) corporations and organizations; in addition to direct funding, the program was also supported by an additional thirteen (13) sponsors who provided tours, speakers, and teaching material. This program serves to raise teachers' level of awareness of topics related to the use of coal to produce electricity and to provide them with new teaching ideas

and information for their classrooms. It also provides resources, both teaching materials and human resources, that will assist teachers in aligning classroom instruction with the revised Virginia Standards of Learning in science.

### GOALS OF THE PROGRAM

The purpose of this program is to enable Virginia teachers to;

1. Develop an understanding of the formation of coal and the development of the coal mining industry;
2. Develop a basic understanding of how electricity is produced from coal and the environmental issues inherent therein;
3. Comprehend how coal and electricity affect the quality of life for all Virginians;
4. Understand how basic economic concepts are reflected in energy production;

5. Develop strategies for applying this information to classroom instruction through the Virginia Standards of Learning, and
6. Build partnerships among business, industry, government agencies, institutions of higher learning and public schools.

### **IMPLEMENTATION OF THE 2003 ENERGY EDUCATION PROGRAM**

The program's goals are achieved through instruction provided during an intensive two-week, 3-hour graduate course offered at Virginia Tech. Educators from across Virginia participated in the 2003 VA Tech Energy Education Program held from July 13-25, 2003. Participants represented grade levels 3-12 and most of the regions in Virginia. Each participant's expenses were paid through a scholarship provided from project funds, including three hours of graduate tuition at Virginia Tech, resident housing and meals at Virginia Tech and UVA's College at Wise, and transportation (for field experiences) during the course.

The first week of instruction was based on the Virginia Tech campus in Blacksburg, VA and class meetings were held daily from about 8:30 a.m. until about 4:00 p.m. at the Donaldson Brown Conference Center. Speakers from Virginia Tech included those from the Colleges of Agriculture & Life Sciences, Engineering, and Liberal Arts and Human Sciences. Industry speakers represented Alpha Natural Resources, Inc., American Electric Power, DBT America, Inc., Dominion Energy, and Norfolk Southern Corporation.

On Sunday evening the teachers were welcomed to VA Tech by Dr. Jerome A. Niles, Dean of the College of Liberal Arts and Human Sciences with dinner in Alumni Hall. Following dinner, John R. Jones, retired President of AEP Pro Serv, Bill Fox, Jr., Senior V.P. Coal Services, Norfolk Southern Corp., and Mike Quillen, President, Alpha Natural Resources, Inc. spoke to the teachers about the cooperative role of industry and educators and the desire of industry to support energy education in our public schools. These three gentlemen have been involved both directly and indirectly with the energy education program since its inception in 1996. They are all three VA Tech alumni and are long time friends whose paths have crossed both personally and professionally many times over the years, including their involvement in this program.

Mary Quillen, Program Director shared a video, *Balancing Needs: Coal and the Environment* produced by the American Coal Foundation which introduced the teachers to the two weeks of intensive study about coal, electricity and the environment. Keith Drohan, Dominion Energy was the first industry speaker on Monday and he opened with a power point presentation about transmission of electricity on the national grid and what this means to the individual consumer. He also discussed the economics of buying and selling of fuels and the electric power itself and how this practice is carried out on the commodities market. The teachers explored environmental topics with Dr. Carl Zipper, Assistant Professor from the College of Agriculture & Life Science and Director of the Powell River Project, a Virginia Tech research facility located in Wise County. Dr. Zipper shared with

the teachers an extensive overview of research being conducted by both faculty and graduate students related to post mined land uses. He set the stage for the tour of the Project during the second week of the course. Dr. Zipper also addressed the topic of various mining methods and explained the importance of each to the coal industry. Economics is a very important component for the coal and electric utility industries. The teachers had an opportunity to hear from Dr. Mike Ellerbrock, Assistant Professor of Environmental Economics and Director of the VA Tech Center for Environmental Economics. Dr. Ellerbrock's relaxed and unique style of teaching was well received by the teachers and his message about economic decisions were timely. The teachers were not only able to understand the topic of economics, but were entertained by his great sense of humor and dynamic personality. The teachers left the session wanting to know more about economics. Dr. Roe-Hoan Yoon, Nicholas Camicia Professor from the Department of Mining Minerals Engineering discussed his research with Clean Coal Technology. Dr. Yoon is highly respected both nationally and internationally as one of the foremost authorities on Clean Coal Technology research. His power point presentation was very interesting and generated many questions about his work. Many of the teachers expressed an interest in seeing his demonstration project first hand. However, this was not possible as it was on site at a mine undergoing testing. The teachers had an opportunity to see a variety of different equipment used to mine coal during a tour of the DBT America, Inc. plant in Pulaski, VA. The highlight of the tour for most of the teachers was driving a scoop around the

parking lot at the plant. This experience became even more meaningful to them after seeing one operated during their underground mine tour. Speakers from American Electric Power (AEP), included Bill Sigmon, Power Generation, Gene Jensen, Distribution and Transmission of Electricity, Guy Cerimele. Environmental Topics, and Greg Keenen, Combustion Products. They discussed a wide range of topics related to the production of electricity, energy transmission and distribution, global energy, environmental topics, and uses for coal combustion products. Tom Rappold, Assistant Vice President, Coal Services from Norfolk Southern Corporation discussed the important role railroads play in the transportation of coal to the consumer, primarily power plants. Mr. Rappold brings to life the history of the railroads and their role in the development of the Southwest Virginia coalfields. The first week of the Energy Education Program concluded with an informal afternoon discussion session about what the teachers had heard/learned during the week, answering questions covering a variety of topics; how they intended to connect this information to classroom instruction; ideas for their final project; and what to expect during the second week in the coalfields.

The first week of classroom instruction set the stage for field experiences during the second week, which is based out of UVA's College at Wise in Wise, Virginia. On the first evening in the coalfields, the teachers were treated to an informal discussion/presentation by Ron Flanary, Executive Director of LENOWISCO Planning District Commission. He began with a historical overview of the development of the Southwest Virginia Coalfields, the

people and the economy and ended with the current economic conditions regarding coal and its future. Monday began with a tour and presentation of the geology of the coalfields with Tony Scales, geologist with the VA Department of Mines, Minerals, and Energy. Tony explained the geology of the Appalachian Plateau and used a variety of geology and topographic maps to help the teachers relate to where the coalfields were located. The tour began at Flag Rock in Norton and continued across this quadrangle to the Powell River Project where Extension Agent Jon Rockett led a very extensive and informative tour of the Project. Here the teachers were treated to a first-hand view of active surface mining, reclamation, and post mined land uses. Many teachers come to the program with preconceived notions about the disturbance of vast tracts of land due to surface mining. Jon quickly relieved their concerns by explaining how mining and reclamation work hand-in-hand to restore the land. The teachers had an opportunity to see several projects where the land had been restored to productive, post mined land use. The teachers left the Powell River Project with a completely different perspective and a more positive view of the surface mining industry.

The remainder of the week included five days of new and exciting experiences for the teachers. The teachers toured Red River Coal Co.'s surface mine in Wise County under the guidance of surface mining expert and one of the mine owners, Mike Thomas. This was an exciting and unforgettable experience for the teachers to see such an extensive operation. They had an opportunity to ride along with company drivers in a 150 hauler as they removed

overburden from a coal seam. They saw a team preparing the site for a "shot" to crack the overburden for removal and later saw the "shot" actually take place. All could say was "WOW!!" A second unforgettable experience for the teachers was their tour of CONSOL Energy's Buchanan #1 Mine. They had an opportunity to see both a longwall operation as well as a room and pillar operation using a continuous miner in the largest coal producing mine in Virginia. This is a shaft mine that is over 1,800 feet below ground and none of the teachers had ever been that deep underground. Several were a bit apprehensive as they entered the elevator, but their anxiety was soon forgotten as they observed the mining operation and talked with the miners operating the equipment. They recognized a shuttle car from their tour of D. B. T. America, Inc. and saw what it was actually used for in the mine. They were amazed by the high level of technology used in mining today. It certainly did not fit with their notion of mining prior to participation in the class. The teachers had an opportunity for another unique experience, they were introduced to Coal Bed Methane Gas and how it is used to produce electricity. They had an opportunity to see a unique CBM power plant jointly owned and operated by CONSOL Energy and Allegany Power Co. that is totally operated by computers, no humans on site. Other field experiences included a tour of AEP's Clinch River Plant, a coal-fired generation facility. The teachers were welcomed to AEP's Clinch River Power Plant by a very large sign that read, "Welcome Energy Education Group". The tour was planned by Plant Manager Richard Gail and the teachers were led in small groups through the different areas of the plant to learn first-

hand about power generation. At the conclusion of the tour the teachers were treated to a wonderful lunch hosted the management and staff of Clinch River Power Plant. The teachers had the opportunity to learn about coal preparation at Paramount Coal Company's Toms Creek Plant. The teachers were welcomed by Daniel McFaddin followed by an introduction and overview of coal preparation as well as safety training. The teachers were divided into two groups and experienced an extended tour of the rail load-out facility, the prep plant, and the coal research lab. The teachers also had an opportunity to tour the coal research lab which was conducted by Daniel McFaddin. The final site visited by the participants was the state offices of the Virginia Department of Mines, Minerals, and Energy. The program was coordinated by Public Relations Director, Mike Abbott. He welcomed the teachers and presented an overview of responsibilities of the regulatory agency. Presentations were made by specialists in the fields of safety, geology, coal bed methane recovery and mine mapping. The teachers were impressed by the level of technology used by the regulatory agency.

The two-week intensive graduate course offered these educators a wide range of opportunities to learn about many topics related to coal and the production of electricity. They gathered resources, took slides and digital images on site in the field, networked with representatives in business, industry, government, and education, and devoted themselves to the study and understanding of these many topics. The participants are expected to return to their school divisions and classrooms better prepared to educate future generations

of citizens about each of the topics addressed throughout the two-week program. Each participant is expected to develop a unit of lesson plans to be used in his/her classroom instruction that teaches concepts related to coal mining and the production and transmission of electricity. These lesson plan units are due by November 1, 2003.

## EVALUATION OF THE PROGRAM

Every presentation and field experience was evaluated by each teacher on a scale from 1-5 (5 being the highest score) and they were asked to write comments about their impression of the speaker or experience (this was requested by our partners/sponsors the first year of the program's implementation and has been continued each year). The results of the survey have always been very positive and this year was no exception. The overall rating for the 2003 Program was very high. The table below summarizes the results of numerical evaluations.

<b>Category Ratings</b>	<b>Average</b>
Presentations at Virginia Tech	4.80
Field Experiences in Southwest Virginia	4.90
Organization of the Class	4.95
Resource Materials	5.00
Overall Rating	4.91

With the steady decline of energy education in the public school

classrooms over the past two decades, it is critical that this issue be addressed. Eight years ago VA Tech recognized this need and committed to working with the coal and electric utility industries to address this void in the education of our young people. Since its inception, the University has never wavered in its commitment to this program. It is believed, by most industry representatives, to be one of the most successful outreach programs currently being offered; these same individuals agree that education is the key to a better understanding of their industry. The teachers also agree with this observation and their comments and impressions are passionate, extensive and heartfelt. The teacher's appreciation for the opportunity to participate in the program was most apparent in their expression of gratitude to all the sponsors for making this experience possible and to all the speakers and tour guides for sharing their expertise. It is obvious from their comments that the experience was a positive one and the teachers found the Institute to be informative, interesting, and helpful to them as educators. The following comments are excerpts from their evaluations, which illustrate only a small sample of their enthusiasm and appreciation.

"Excellent knowledge of the industry. we need a balance (environmental and standard of living)."

"Great use of active participation! Wonderful sense of humor. Excellent presentation of a complex subject...made me realize that energy is a commodity!"

"Loved the big equipment and friendly people. They dropped everything to host

our group. This company is an excellent example of all that is right; a realistic example I can share as productive career options. All of the people here truly enjoyed having teachers tour their facility; made me feel really good about being a teacher."

"Dr. Z is a great presenter...got me excited about our site visit. I was amazed by the amount of work to reclaim mined land. Would love to take one of his classes."

"The overview of mining was very useful in setting the stage for our visit to the coal fields. Great Power Point presentation."

"Dr. Yoon's Clean Coal Technology presentation was wonderful/wanted to see his work! Too bad it was on the mine site being tested."

" I loved John Jones' candor...sure opened my eyes about production of electricity and how we take it for granted."

"Finally, someone explained transmission of electricity on a level that laymen can understand. Loved his activities, he got us involved."

"Greg certainly enlightened us all with his presentation on the many and varied uses of combustion products. Had no idea that refuse was so useful! Loved his graphics."

"Tom has a great sense of humor! Especially enjoyed the video and the history of the development of the railroad industry and its role in the development of the coalfields in Virginia."

"I was glad to see such a reclamation project with such great diversity! Jon is a treasure!!"

"A win/win opportunity to make land NOT just stable, but productive. I never knew this project existed."

"Tony is a knowledgeable and humorous person...I felt as if we all made a new friend."

"Mike Thomas is too good for words! Very impressive how well the environment is restored on this site. He sets the standard for management."

"Is there a better word than "Awesome" for Mike Thomas?"

"What can I say about CONSOL Energy; Terry and all the people at Buchanan #1 are incredible....the underground mine tour, WOW!!!. It was everything and more than I expected."

"Great tour of the AEP plant. More friendly and helpful people. It is important to see that a coal fired generating plant can be efficient, cost effective and environmentally friendly."

"The prep plant was great to see and very interesting; coal washing and preparation is probably the least known or understood part of the coal-electricity industry. Impressed by Paramount's desire to implement technology to better serve their customers. Would have loved to see them load a unit train. Daniel McFaddin is one of the nicest people I have every met, he made my day."

"Great hospitality at DMME. Interesting to hear from the regulatory agencies. DMME really brought everything

together, all the pieces of information we have learned over the 2-weeks fell into place. Wonderful to see how business/industry and regulatory agencies work together. Loved the presentations and the wonderful people.

"A GREAT CLASS!! What an undertaking to organize this class! This program is wonderful and I plan to go back to my school division and encourage all of my colleagues to apply for this class! You WOWED me every day!!"

"This course is SOOOOOO needed by so many!!!"

"Hey Guys, did we have a BLAST or what!"

"This is an experience I will remember forever, THANK YOU!!! Everything was an "eye opening " experience, it was beyond words!"

"No other class that I have taken compares to this one!!"

"The interaction with the coal and energy "experts" was a rare opportunity for teachers. I was so impressed with the willingness of all the people who took time away from their job responsibilities to share their expertise with us. Teachers rarely experience this level of appreciation, it really made me feel special, valued and needed."

"Well planned. Excellent program; better than described in the course description. Change nothing! The best class I have ever taken."

" (Resource materials) WOW!!"

“Having classroom activities the first week really helps to make the field trips easy to understand. I actually knew what most of the tour guides were talking about by the time we got to Wise County.”

“The theme that ran throughout this course was safety and environmental stewardship; you just do not “toot” your own horn loud enough. You certainly have both my admiration and gratitude for continuing to provide the important ingredients (coal and electricity) that support the quality of life I enjoy. Thank you from all of us!”

“The people, their kindness, and consideration was wonderful. I was made to feel so special; teachers don’t often receive this level of attention.”

“Having the opportunity to get to know and interact with colleagues from throughout Virginia was one of the highlights of this class.”

## **CONCLUSION**

The 2003 VA Tech Energy Education program, *Coal to Electricity*, was a great success. Elementary, middle and secondary science teachers from across Virginia completed the two-week intensive course and will return to their classrooms this fall with a wealth of newfound knowledge, informed understanding, and teaching resources. It is estimated that more than 500 students in grades 3-12 across Virginia will reap the benefits, just this year alone, from the participation of the teachers in the 2003 VA Tech Energy

Education Program. These teachers will prepare and deliver instruction that will broaden and expand students’ understanding and knowledge about coal, electricity and related topics. It is expected the teachers will use their experience and resources to implement the revised Virginia Standards of Learning in science in ways they never imagined possible.

## **ACKNOWLEDGMENTS**

Through quality educational efforts, such as this one, teachers can stay abreast of important issues and remain informed about relevant topics they must address in Virginia’s classrooms. The VA Tech Energy Education Program would not have been possible without the continued partnerships and interest of many individuals, organizations, and sponsors. I would like to gratefully acknowledge their generosity for direct financial support, human resources, and teaching material. I am especially grateful to Alpha Natural Resources, Inc., The American Coal Foundation, American Electric Power, Center for Energy and Economic Development, Center for Environmental Economics, CONSOL Energy, DBT America, Inc., Dominion Energy, Eastman Chemical Co., LENOWISCO Planning Commission, National Energy Education Development Project, National mining Association, Massey Energy, Norfolk Southern Corporation, North Carolina Coal Institute, Paramount Coal Company, Powell River Project, Pace Carbon Fuels, Inc., Red River Coal Company, United States Department of Energy, United States Department of Mine Safety and Health Administration, University of Virginia’s College at Wise,

Virginia Department of Mines, Minerals & Energy, Virginia Energy, Inc., Virginia Polytechnic Institute & State University and William P. Rogers, Consultant.

Each individual, organization and industry partner has made it possible for educators to broaden their understanding of environmental issues related to coal and electricity, to experience the coal fields firsthand, and

to appreciate the important role of coal in the economy of Virginia as well as the United States; for this, I am very appreciative and grateful. I encourage each of you to continue to enthusiastically embrace and support quality educational effort such as the VA Tech Energy Education Program; the benefits are immeasurable for all of us.