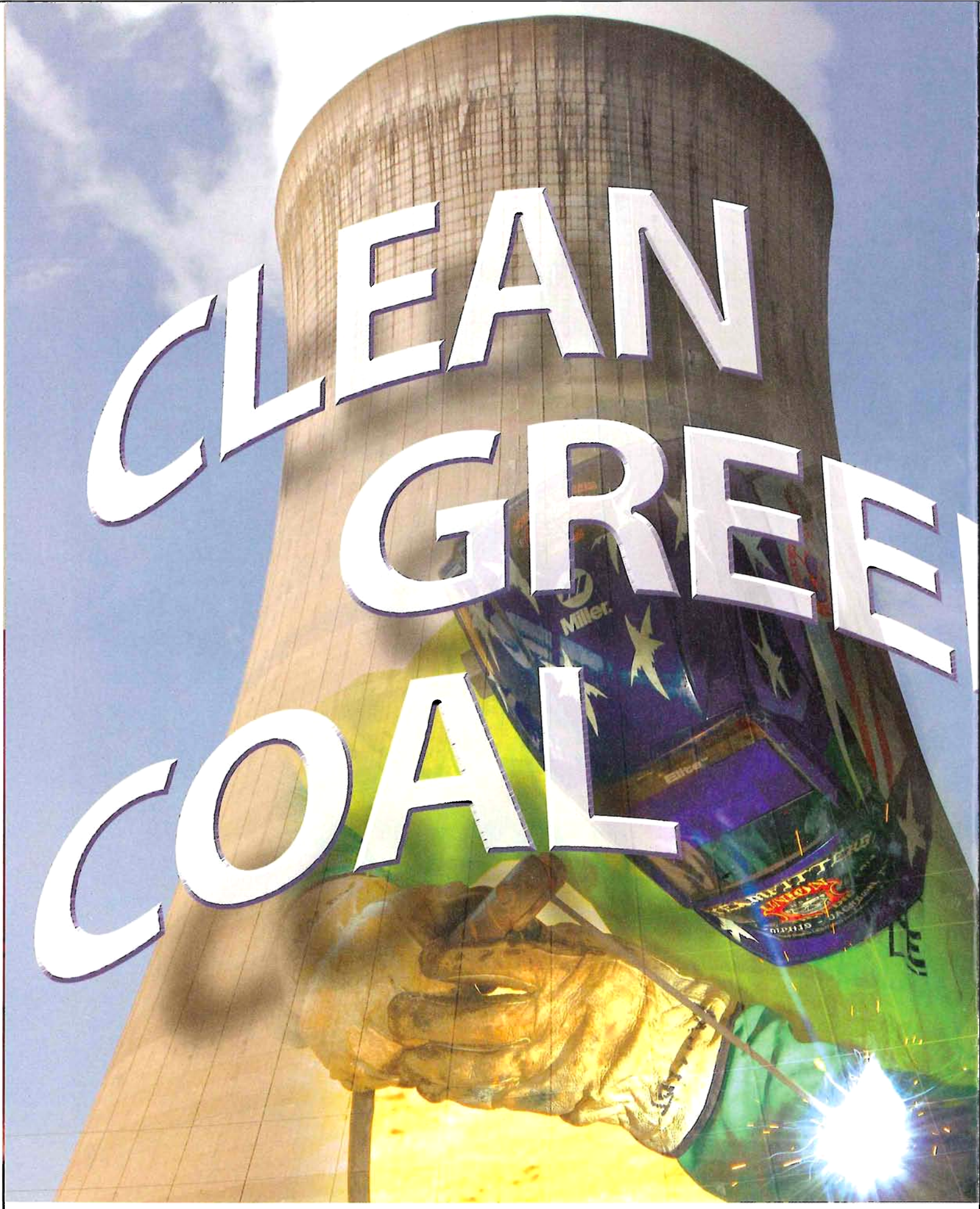
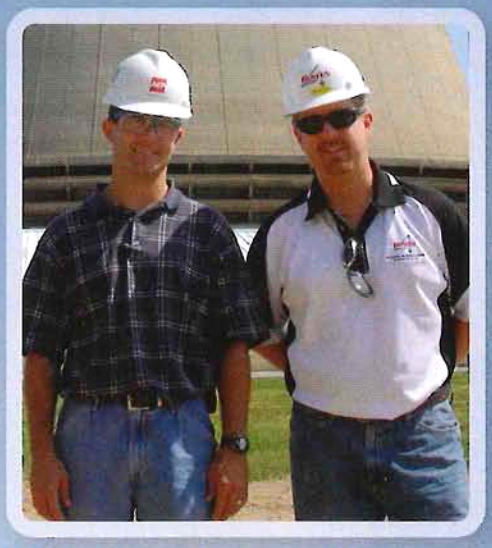

CLEAN
GREEN
COAL

Mountaineer Power Plant
Coal with Carbon Capture and Storage

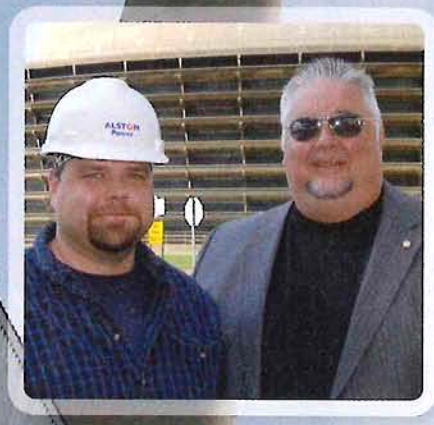
Piping Superintendant Doug Byers, International Representative T.L. Ranson, Business Agent Keith Hoskins, General Foreman Doug McNelly, Business Manager Eddie Mullins, Project Superintendant Bert Bush, Bowen Project Manager Jon Burns, QC Bobby Cole, Local 577



AEP Project Manager Brian Sherrick, Bowen Project Manager Jon Burns

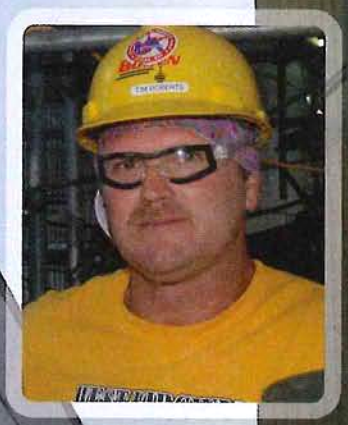
As demand for electricity continues to rise and pressures to alleviate global warming continue to climb, industry experts in the coal sector have been striving to make progress in clean coal technology. While some opponents to clean coal see this initiative as merely a delay tactic for the overall progression of other sustainable technologies such as wind and solar, it is clear that America relies on coal, which remains a rich and abundant resource in this country. Coal-fired power plants produce nearly half of the electricity in the United States, so finding a way to clean up the technology appears to be a more viable choice than trying to eliminate it altogether. With incentives from the federal stimulus package totaling $3.5 billion for clean coal projects, industry representatives are quickly getting on board. American Electric Power (AEP), the largest coal-burning electric utility in the Western Hemisphere, has a vested interest in being a leader in climate change policy issues. Partnering with technology provider, Alstom Power, AEP hopes to bring the Mountaineer Power Plant in New Haven, West Virginia, to the world stage—with the first large-scale pilot program involving carbon dioxide capture and storage (CCS). The unit is built right next door to the power plant, and if the technology demonstrates to be successful it could evolve to commercial use within the next few years.

The journeymen and apprentices of Local 521 constructed over 20,000 linear feet of predominantly stainless steel piping, all contained in an area of approximately 10,000 square feet.



Field Engineer Travis Ranson, Local 625; International Representative T. L. Ranson

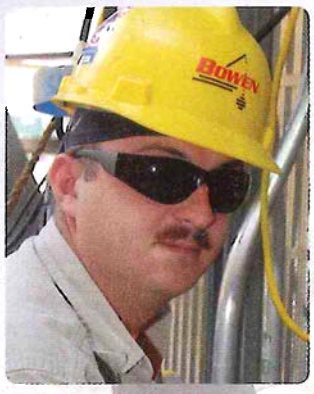
Journeyman Troy Loftis, Journeywoman Teresa Young



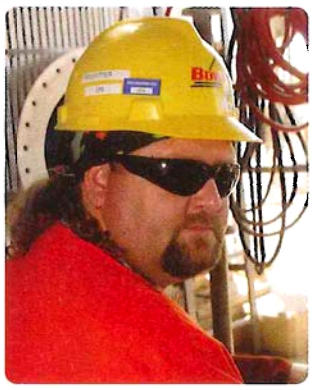
Journeyman Tim Roberts

Brown Electric Apprentice Brodie Cochran, Journeyman Rick Roberts, Journeyman Dale Bragg

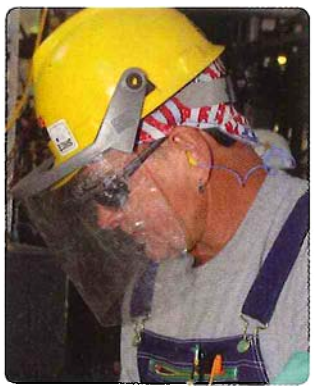
Journeyman Jamie Patrick



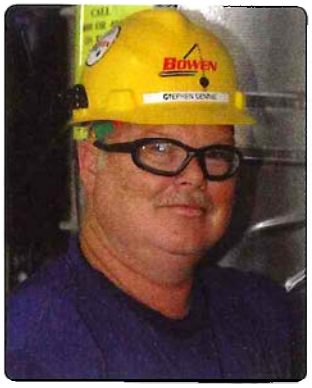
Journeyman Jason Humphreys



Journeyman Mark Clagg



Journeyman Joe Igleheart

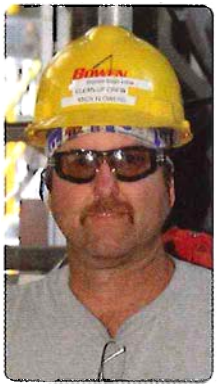


Journeyman Stephen Dennie

Foreman Tony White, Foreman James Howard

Journeyman Tim Humphreys, Journeyman Mark Traylor

Brown Electric General Foreman Mathew Arnett, Journeyman John McDermitt III



Journeyman Andy Flowers, Local 168

Bowen Engineering took on this monumental task, and the team that they assembled included 80 highly skilled journeymen and apprentices from Plumbers and Pipefitters Local 521, Huntington, West Virginia. Jon Burns, project manager, Bowen Engineering, described his team as "the best fitters anywhere." The journeymen and apprentices of Local 521 constructed over 20,000 linear feet of predominantly stainless steel piping, all contained in an area of approximately 10,000 square feet. It was noted that the welding on this project was top notch, with a 95 percent weld test pass rate, which speaks for itself. Field non-destructive testing came back at 98 percent, and the quality was described as being exceptional. This particular project has had many accolades, and Bowen will soon be presenting it for the Aon Build America Award. This award honors members of Associated General Contractors of America who build the nation's most impressive construction projects.

The recognition that the members of Local 521 received on this job did not go unnoticed by International Representative T.L Ranson, Local 521 Business Manager Eddie Mullins and Business Agent Keith Hoskins. Some of the aspects of the project cited as exemplary were the quality of craftsmanship, the journeymen and apprentices' cooperation, and the intense focus on the project's goals for the customer, to name just a few. Once Bowen has completed the project, members of Local 521 working for Professional Construction Services (PCS) will continue to do all of the maintenance associated with the CO_2 unit. The local also has members working for Enerfab who have been responsible for all of the maintenance on the powerhouse. In addition to Bowen, Brown Electric also had Local 521 craftsmen on the job ensuring that all of the instrumentation was up to task.

Brother Mullins stated, "This particular project has been a very high-profile project, and it will continue to be a showcase for the world. Our members can take pride in being involved in the very first pilot carbon dioxide capture and sequestering project built right next to the power plant. They will remember that they were on hand to push clean-coal technology to the next level."

American Electric Power has spent $73 million on the capture and storage effort, which includes half of the cost of the plant. Alstom Power, the manufacturer of the chilled ammonia process technology that has been pivotal to the success of this project, has stayed mum on exactly how much it has spent on this venture. It has been speculated throughout the industry that, combined, AEP and Alstom have spent well over $100 million.

The 1,300-megawatt Mountaineer Power Plant, which is located in the heart of the largest concentration of fossil-fueled power plants in the nation, does not look much different from the scores of power plants that exist in the United States. If you look closely though—next to the plant, along the Ohio River—there are two wells that

run 8,000 feet below the surface. The carbon dioxide (CO_2) will be compressed and injected deep inside the rock to be stored indefinitely in the saline rock formations. The initial trial is a modest one, with the aim being to trap 100,000 tons of CO_2 a year, the equivalent of a 20-megawatt (electric) power station, which is big enough to generate power for roughly 20,000 homes. If the trial is a success, its usefulness around the world would be monumental to countries such as China and India that rely on an abundance of coal-fired plants to generate electricity and have been under pressure to join in the effort to combat global climate change.

The 50-foot tower that rises up alongside the Ohio River is where some of the plant's emissions will be diverted. To start the process, the flue gas is chilled to 35 degrees Fahrenheit. A chilled ammonia-based solvent, which is ammonia carbonate, will absorb the carbon dioxide to make ammonium bicarbonate in this tower. Ammonia bicarbonate slurry is pumped to a regenerator for CO_2 removal. At this point the ammonium bicarbonate is converted back to ammonium carbonate and is reused to repeat the process all over again. The clean flue gas, containing mainly nitrogen, oxygen, and very low concentrations of CO_2, flows to the stack and is released into the atmosphere. The captured CO_2 is compressed into a liquid, piped a short distance, and injected into the deep storage wells that exist next to the power plant. The deep layers of porous rock will hold the CO_2, and the thousands of feet of dense shale will keep it in place. What consumes the most energy in this process is the removal of the carbon dioxide. Because this particular ammonia solvent does not hold as tightly to the carbon dioxide as other solvents, this process allows the carbon dioxide to be moved utilizing less heat, thus using less energy.

The mechanical piping on this job proved to be a challenge. It was noted that continuous rerouting of pipe and additional lines of pipe were never ending. "We identified a foreman to create a punch list after each piping system had been installed," Bowen Engineering Project Manager Jon Burns explained. "We maintained and finished the punch list with each turnover package. This ensured that each system was turned over complete." Burns continued, "The constant adjustment by the general foremen and foremen with manpower was critical to our success. The foremen knew the capability of their men, and the use of labor was very prudent. The foremen and crews set their own goals for a week or month. They were able to track this goal, and were rewarded for meeting or exceeding the goals. Operation plans were written by each foreman on a weekly basis. These plans represented the detailed plan of action to doing a particular task. I strongly believe the workforce on this project bought into the job, and they became the most vital part of the team, which allowed us to complete this job on time and with zero injuries."

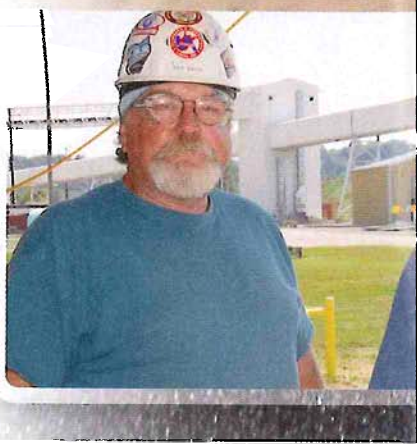
The crews worked tirelessly, and the craftsmen worked two shifts, six to seven days a week to get the job done. Bert Bush, general superintendent, said it best: "We would like to thank the field foremen and the craftsmen because it is the people who carry the tools and turn the bolts that make the rest of us a success."

At peak construction, there were 80 pipefitters working between both shifts. It was noted that the work area was very tight, and the lay-down yard to feed materials to the 80 pipefitters was very small. The team established a foreman's request sheet to give to a small yard crew who constantly replenished the materials to the small yard to keep the job productive and efficient.

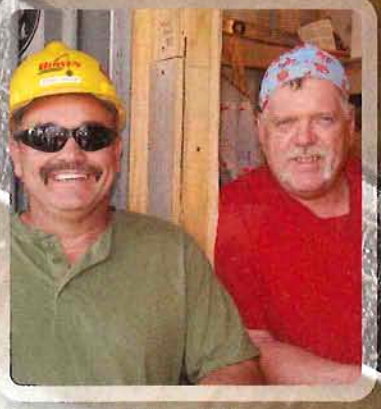
The initial project began in July of 2008 and finished up in early September. Alstom Power is currently in a test phase. It is anticipated that the plant should be online in the later part of October 2009. Upon completion, Bowen had utilized over 100,000 manhours to support this project without a single recordable injury. This in itself is an impressive feat, and it speaks highly of the management and supervision team of this project, and the way in which they viewed safety on the job. Bowen kept Burns onsite throughout the duration of the project. This allowed Burns access to the client and to his project team, which ensured consistent communication for all those involved. The journeymen and apprentices on the job were proficient in their responsibilities and understood the magnitude of this project. Working in a safe environment is a high priority for United Association

Project Superintendant Bert Bush, Piping Superintendant Doug Byers

Journeyman Darren Rowe, Business Manager Eddie Mullins, Journeyman Dale Lunsford, Business Agent Keith Hoskins



PCS Journeyman Paul Swain, PCS General Foreman Jay Wagner



Bowen Steward Terry Crislip, Journeyman Reggie Robertson

Journeyman Gary Thompson

Front row, Bowen Journeyman John Brown, Journeyman T. J. Escue, Journeyman Randy Thomas, Apprentice Scott Riggs
Back row, Business Agent Keith Hoskins, Brown Electric Journeyman Dean Arnoldt, Local 168; Brown Electric Steward Dave Smith, Bowen Journeyman C. D. Adkins III, Business Manager Eddie Mullins, Bowen General Foreman Doug McNelly, International Representative T. L. Ranson

Journeyman Shawn Butler, PCS Steward Dick Smith

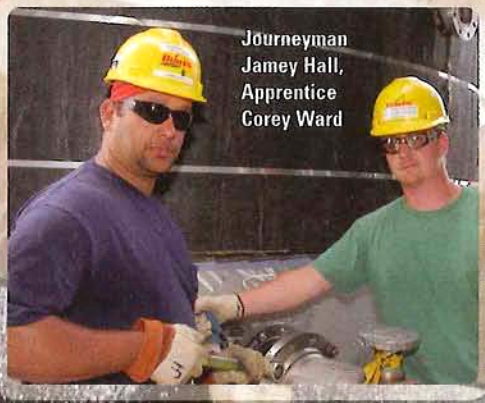
Journeyman Donnie J. Howard, Apprentice Ray Thomas

QC Bobby Cole, Local 577

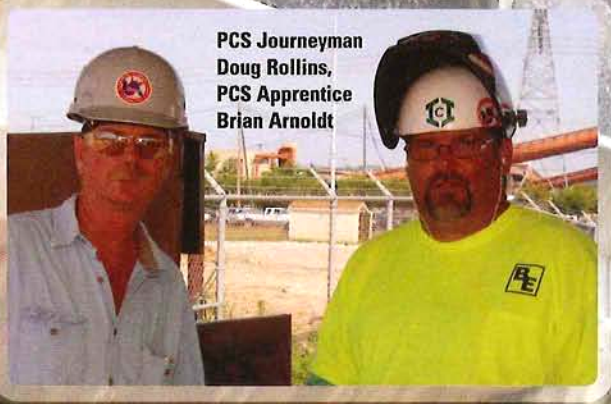
UA Team working for Bowen

"I strongly believe the workforce on this project bought into the job, and they became the most vital part of the team, which allowed us to complete this job on time and with zero injuries."

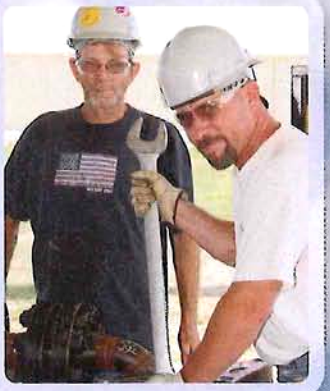
– Bowen Project Manager Jon Burns



Journeyman Jamey Hall, Apprentice Corey Ward

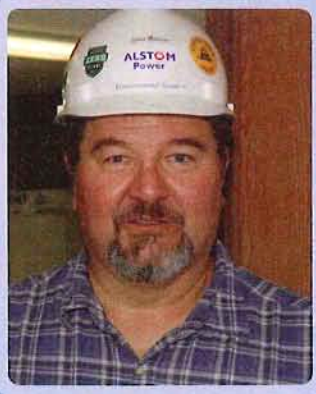


PCS Journeyman Doug Rollins, PCS Apprentice Brian Arnoldt

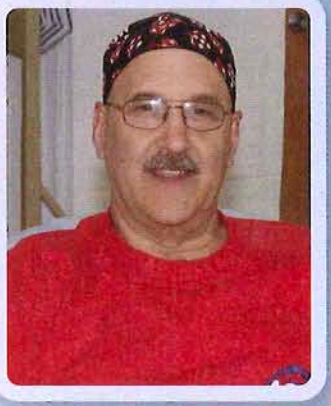


PCS Journeyman Ron Jarvis, PCS Journeyman Mike Rhodes

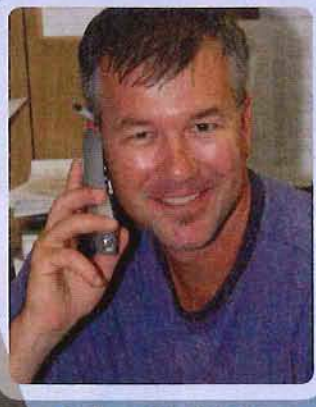
International Representative T. L. Ranson, Journeyman Doug Smith, Business Manager Eddie Mullins, Journeyman Dave Sowards, Journeyman Joe Igleheart, Business Agent Keith Hoskins



Alstom Project Manager John Barren

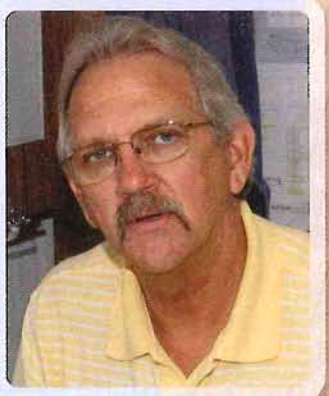


Bowen General Foreman Doug McNelly



Project Engineer Mike Wright

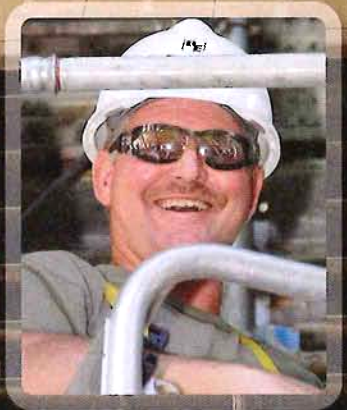
Brown Electric crew, bottom row, Instrument Superintendant Mike Money, Journeyman Gary Thompson, Journeyman Dean Arnoldt, Local 168; Apprentice Brodie Cochran
Top row, Journeyman Rick Roberts, General Foreman Mathew Arnett, Steward Dave Smith, Journeyman John McDermitt III, Journeyman Dale Bragg, Journeyman Doug Arnett, Local 452



Bowen Project Superintendant Bert Bush

Journeywoman Sheila McFeeley

Project Engineer Rick Kelly

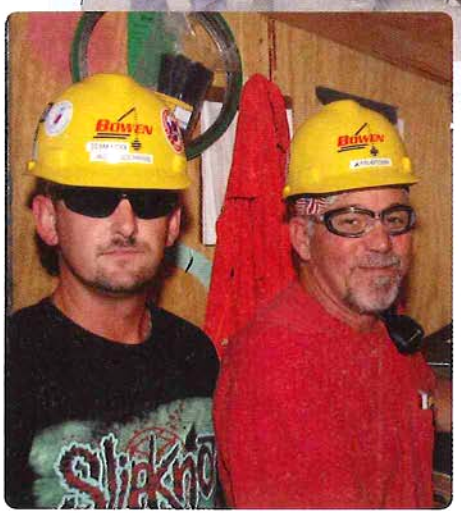


Journeyman Dean Arnoldt, Local 168

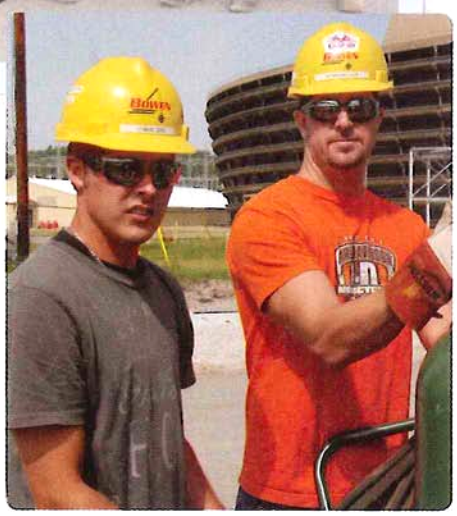
Journeyman Barry Stevens

Foreman Tony White

UA Night Crew working for Bowen



Foreman Jason Cochran, Foreman John Brown



Apprentice Chase Ord, Local 168; Journeyman Kevin Wallace

members, and their OSHA training is a benefit to all.

Jeff Miles, construction advisor, American Electric Power, stated, "Bowen's team has been one of the most professionally organized teams I have worked with, which includes all of the craft members. Safety has been their first priority as well as ours throughout this project. Even with all of the piping issues that we experienced, the team never lost focus of our overall goal, which was keeping the project on schedule."

It is clear that continued technology will be the key to coal's future. Natural gas has been safely and effectively stored underground for decades. The process validation facility (PVF) at Mountaineer is based on Alstom Power's coveted chilled ammonia process technology. There is a lot riding on this technology. If the technology is successful, it could be responsible for preventing 90 percent of the carbon dioxide emitted by power stations from being released into the atmosphere. This would be a huge boost for climate change policy and help ease the growing concern over the detrimental effect of green house gases.

One of the roadblocks all along for this technology has undoubtedly been cost. Although individually the technologies to capture, transport, and bury carbon dioxide have already been used in oilfields and chemical plants, no one has built an entire system attached to a power station. Researchers are bracing themselves to see just how much of the plant's energy output the new technology will consume, and yet power company representatives remain optimistic that capturing and sequestering carbon dioxide is the industry's best hope for diminishing carbon dioxide emissions in the next decade. Industry representatives are anticipating it will take about 15 to 20 percent of the plant's power output to run the process, which is half the power other carbon capture technologies use.

CO_2 is not toxic or flammable, but it is heavier than air and can cause suffocation if present at high enough concentrations. The gas, however, is routinely handled safely in large quantities every day by multiple industries. For the technology to be acceptable, however, the public must be assured that safe practices have been developed for CO_2 sequestering. Prior to the initial phase of this project, AEP joined with the Department of Energy, the Battelle Memorial Institute, the Ohio Coal Development Office, and other partners to develop and monitor CO_2 capturing and sequestering. A detailed study of the surrounding rock formations took place. In addition, the nonprofit research group, the Battelle Memorial Institute, has installed monitoring wells around the rock that will measure changes in pressure and temperature. Engineers can also send energy pulses through the earth between the wells and measure how fast these travel, as a guide to how the carbon dioxide is spreading. The Electric Power Research Institute has signed on to help monitor the technology as well.

America has the largest coal reserves in the world, making coal the country's most abundant energy source. Coal used for electricity has more than tripled since 1970, while emissions have been reduced by more than one-third. The technology for clean coal is here today and will continue to be developed for second-generation technologies for CO_2 capture. It is expensive, and it has been difficult to get the funding to make this technology available everywhere. While moving ahead with other sustainable technologies is a positive notion, coal must remain part of the equation—a means to take us to the next energy renaissance. The issue of climate change and green house gas emissions is a global issue. The validation going on at the Mountaineer Power Plant could have a huge global ramification. If we develop the technology here, it will make its way to the world stage. It is on the world stage that we combat issues such as global climate change.