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U.S. Prep Plant Census

- Operators invest in more capacity

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FEATURE ARTICLES

- **12** 2023 U.S. Prep Plant Census Operators add capacity to process future production
- 20 Pragmatic OEMs Balance Customer Needs With Low-carbon Goals Top truck and shovel OEMs enter partnerships and develop solutions to help customers achieve their most critical goals, which align with the U.N.'s 2030 Agenda
- **28** Shortage Raises Concerns, Opportunities *A two-way radio shortage means miners will have to find alternatives, creating opportunities for suppliers and distributors*
- 30 Wireless Networks Improve Safety, Efficiency
- 32 Diamond Bits Boost Productivity for Roofbolters

LEADING DEVELOPMENTS

- 4 Whitehaven Coal to Acquire Daunia and Blackwater Mines from BMA
- 4 Arch Revises Guidance Downward on Leer South's Performance
- 5 Sev.en to Acquire Majority Stake in Coronado Global Resources
- 5 Teck Provides Met Coal Sales and Pricing Update

U.S. NEWS

- 6 American Resources to Sell Coal Assets
- 6 Coronado Supports BSU Mining Engineering Technology
- 7 Alpha Revises Full Year 2023 Guidance Downward
- **10** *X-BATT JV With CONSOL to Revolutionize Battery Technology*

WORLDWIDE NEWS

- 8 Australian Court Dismisses Lawsuit Involving the Narrabri Project
- 8 South Africa Breaks Up Coal-smuggling Gangs
- 9 Germany Keeps Coal Online
- **9** Asia-Pacific Continues to Build Coal-fired Capacity
- 9 CIL Initiates Recruiting Efforts
- 11 Northback to Explore Grassy Mountain
- 11 Donkin Miners Wait for Approval to Restart

NEWS/4



TRUCK SHOVELING MINING/20

U.S. PREP PLANT CENSUS 2023/12



COMMUNICATIONS/28



THIS ISSUE

This month, Coal Age publishes its annual prep plant census, which provide details on the plants upgrading bituminous coals.

DEPARTMENTS

- **2** Editorial
- 4 Leading Developments News
- 6 U.S. News
- 8 Worldwide News
- **10** Dateline Washington
- 32 Operating Ideas
- 34 Suppliers News
- 36 Product News
- 39 Classifieds
- 40 Closing Notes

The Unabated Debate



By Steve Fiscor Publisher & Editor-in-Chief

In much of the net-zero discourse taking place, there are a few terms that environmental activists use that target coal use. For example, they usually talk in terms of "stationary sources" of pollution emitted from the use of fossil fuels. Use of that term narrows the discussion from all sources to power plants, and excludes the transportation sector and it's use of gasoline and diesel fuel.

Unabated coal use is another term that appears more frequently. In the case of coal-fired power generation, that terminology is understood to mean plants that do not use carbon capture, utilization, and storage (CCUS). So far, the industry has seen only limited success with the use of CCUS. So, some activists have taken this a step

further saying that no matter the efficiency of the underlying process, the use of coal-fired power will result in unacceptable levels of pollution. Therefore, the world should stop burning coal.

For most of the world, discontinuing the use of coal would be incredibly costly and for some countries it would simply be preposterous. When people are faced with the preposterous, most ignore it and move on.

The International Energy Agency and the Intergovernmental Panel on Climate Change should broaden the discussion to include the use of abated coal, based on coal quality and coals that have been washed. This edition of *Coal Age* identifies many of the coal preparation and handling facilities that are removing the impurities from coal before it's ever loaded into a railcar.

Environmental activists, who scoff at the term clean coal, have successfully blocked ports on the U.S. west coast from exporting cleaner burning coals to China. While their effort thwarted the use of some coal, they failed to make a dent in the amount of pollution that China currently generates from coal use. That coal may have displaced unabated coal, which would have reduced pollution. Instead of buying coal from the U.S., China continues to import it from Australia, Indonesia, North Korea, and Russia. The situation is similar in India.

For the sake of the environment, activists are now trying to block new mines and expansions at the permitting stage. This is happening with the Signal Peak Energy expansion in Montana, the Woodhouse Colliery in the U.K., the Garzweiler mine in Germany, and Whitehaven Coal's Narrabri mine in Australia (Worldwide News, p. 8). They are not so concerned about the long-term effects of mining on the regional environment as much as stopping the use of coal in the name of climate change.

If these groups win these lawsuits, they will only succeed in driving up the cost of electricity and they will not make a dent in improving the climate. They will hamstring developing economies and allow major polluters to continue unabated. As difficult as it might be, the definition of unabated should be revised and it should recognize the importance of the underlying process to reduce pollution and coal operators should be given credit for trying to displace unabated coal with beneficiated coal.

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Whitehaven Coal to Acquire Daunia and Blackwater Mines from BMA

Adding BMA's Daunia and Blackwater mines will position Whitehaven as a leading met coal producer. Above, a dragline, one of seven at the Blackwater mine in Queensland, Australia, moves overburden. (Photo: BHP)

Australia's Whitehaven Coal confirmed that it has executed definitive sale agreements with BHP and Mitsubishi Development Pty Ltd (BMA) to acquire the Daunia and Blackwater coal mines for an aggregate cash consideration of \$3.2 billion. The transaction will position Whitehaven as a leading metallurgical coal producer with pro-forma, run-of-mine production of around 40 million metric tons per year (mt/y) with revenues based on 70% metallurgical coal sales and 30% thermal coal sales. The acquisition is expected to close in Q2 2024, subject to certain conditions including regulatory and merger control approvals.

Whitehaven believes it will see significant upside value with attractive growth opportunities in Queensland's Bowen Basin, including synergies with Whitehaven's Winchester South development project. "This is a compelling transaction for Whitehaven that accelerates our strategy, transforms our company and delivers substantial value for our shareholders," said Paul Flynn, CEO and managing director of Whitehaven. "This acquisition will pivot our portfolio towards metallurgical coal, which has been a core pillar of our strategy for many years making this a better-balanced business. Our thermal coal business remains strategically important."

Daunia is an open-cut coal mine located 30 km southeast of Moranbah. It produces a hard coking coal (HCC) and pulverized coal injection (PCI) metallurgical coal products, and it is expected to produce an average of 4.9 million mt/y of saleable coal production over the next five years. The current mine life is 17 years (2040). Daunia is adjacent to Whitehaven's Winchester South development project. Daunia exports coal through the Dalrymple Bay Terminal near Mackay.

The Blackwater coal mine is an open-cut mine that lies 73 km southeast of Emerald and is expected to produce an average of 12.4 million mt/y of coal over the next five years. It is one of the largest coal mines in Australia, with a strike length of 80 km, and has the largest dragline fleet (7) in the Southern Hemisphere. Both HCC and semi soft coking coal (SSCC) metallurgical coal products are mined at Blackwater. The remaining LOM production is expected to be greater than 50 years. Blackwater's coal is exported through the RG Tanna Terminal north of Gladstone.

"Daunia and Blackwater produce much-needed metallurgical coal that is in high demand across Asia – including in India and Southeast Asia where population growth and economic development is expected to drive strong demand for steel production and metallurgical coal through to at least 2050," Flynn said. "This acquisition will increase our exposure to these high-growth market segments while expanding our regional footprint through new customers."

Whitehaven's total coal resources will increase by 75% from 2.6 billion mt to 4.6 billion mt for operating and development mines. The acquisition will increase Whitehaven's Coal Resources in the Bowen Basin from 1.1 billion mt to 3.1 billion mt, including 673 million mt of recoverable reserves.

The purchase price includes \$2.1 billion upon completion, \$1.1 billion in cash over three years after completion and the potential for up to \$900 million in a price-linked earnout payable over 3 years. Whitehaven has placed a \$100 million deposit. The transaction will be funded via a combination of available cash, a \$900 million bridge facility and cashflows of Whitehaven's expanded business over FY2025, FY2026 and FY2027.

Arch Revises Guidance Downward on Leer South's Performance

Arch Resources, Inc. this week revised its full-year 2023 guidance for coking coal sales downward to 8.6 to 8.9 million tons from 8.9 to 9.7 million tons, due primarily to ongoing challenges with mining conditions in the first longwall district at its Leer South mine.

"While we remain enthusiastic about Leer South's long-term outlook, the conditions in the first longwall district – which, as previously discussed, represented the most capital-efficient access point for the Lower Kittanning reserve base - continue to constrain advance rates," said Paul A. Lang, president and CEO, Arch Resources. "In light of these conditions, we are moderating our volume and cost expectations for the balance of the year, even as we continue to benefit from a strengthening coking coal price environment." Despite underperforming relative to initial expectations, Lang said Leer South has now generated approximately \$470 million in segment-level adjusted EBITDA since its startup, versus an initial capital investment of approximately \$400 million.

Arch now expects adjusted EBIT-DA for the Q3 2023 to be approximately 10% lower than the total reported for the Q2 2023. Arch expects discretionary cash flow for Q3 2023 to be more than half the total of \$150.7 million achieved in Q2 2023, which included a working capital reduction of \$62.5 million. These amounts are estimates, actual Q3 2023 financial results will be released on October 26.

Teck Provides Met Coal Sales and Pricing Update

Canada's Teck Resources reported Q3 2023 metallurgical coal sales of 5.2 million metric tons (mt), which fell below its guidance of 5.6 - 6 million mt due to slower than anticipated supply chain recovery following the impacts of B.C. wildfires and the labor disruption at the ports in British Columbia, as well as plant challenges.

The company said it implemented a plant improvement initiative in the Q2 2023 and Q3 2023 and are expecting improved performance for Q4 2023. The realized price for Teck's met coal in Q3 2023 averaged \$229/ mt. The company is expecting to report a positive met coal provisional pricing adjustment of \$23 million in Q3 2023.

Sev.en to Acquire Majority Stake in Coronado Global Resources

Czech-based Sev.en Global Investments has signed a binding agreement to acquire a 51% interest in Coronado Global Resources Inc., from the Energy & Minerals Group (EMG).

Coronado Global Resources produces high-quality metallurgical coal from three mining complexes in two of the largest and most productive metallurgical coal basins in the world, Queensland's Bowen Basin in Australia, and the Central Appalachian region of the U.S. With an annual production of approximately 16 million metric tons (mt), Coronado ranks among the top five met coal producers. The company has total reserves of 550 million mt.

"We are excited to become the majority shareholder of Coronado," said Alan Svoboda, CEO of Sev.en GI. "We believe that Coronado has established a successful business strategy, and we will support the company in continuation of its business strategy to grow and strengthen its position both in the U.S. and Australia. This deal is a testament of our ability to grow rapidly and successfully and aligns with our long-term strategy for international growth in these two jurisdictions."

The acquisition of a majority stake in Coronado will further solidify Sev.en's position as a world-leading producer of high-quality metallurgical coal. In the U.S., Sev.en GI owns the fourth largest U.S. met coal producer, Blackhawk Mining, which mines roughly 9 million mt/y of coal, and the Golden Eagle Land Co., which holds more than 2 billion mt of coal reserves.

"[This transaction] accomplishes EMG's short-term objectives and contemporaneously leaves Coronado well positioned for continued long term success," said John Raymond, founder and executive chairman of EMG. "When we formed Coronado 12 years ago, we did so with the objective of becoming one of the industry's leading metallurgical coal businesses with a large-scale resource base, strong balance sheet and a best-inclass management team with whom we have created considerable value.

"With these constructs in place as we transition the business to Sev.en, the Coronado platform remains well positioned for the future given Sev.en's deep understanding of metallurgical coal fundamentals complemented by their strong balance sheet and stated objective to continue to support and grow the business," Raymond said.

The value of the transaction was not disclosed, and it is subject to customary closing conditions, including regulatory approvals in the U.S. and Australia.



The Curragh complex and its coal handling and preparation plant (above) in Queensland is one of the assets Sev.en will acquire from EMG. (Photo: Coronado Global Resources)

American Resources to Sell Coal Assets

American Resources Corp. said it has entered into a letter of intent (LoI) to sell its coal mining assets to an unnamed group for a total consideration of approximately \$280 million. The consideration takes the form of an upfront cash payment at closing, a share of profits generated from operations, an ongoing royalty payment based on coal sales and a minority equity interest upside. The assets are the McCoy Elkhorn Coal, Perry County Resources and Wyoming County Coal operating subsidiaries, and the transaction includes debt and the reclamation bonds associated with those assets.

"As we have been reviewing various offers and opportunities for our [coal] mining division, we have remained steadfast on maximizing the value of these assets under a variety of potential transaction structures," said Mark Jensen, CEO of American Resources Corp. "We have worked extensively with this potential acquirer over the past several months and believe the framework of this LoI represents an attractive return for our shareholders. We believe the asset base is one of the last remaining low-cost, highly scalable metallurgical [coal] platforms left in the United States."

The company said the LoI is non-binding and non-exclusive, but it does expect it to close before year end. It also said the proposed acquirer of the assets has committed to invest the necessary capital to bring additional mines into full production and expand the number of producing mines.

Concurrent with the executed LoI, American Resources said it will continue to advance its Form-10 filing to spin out its American Carbon subsidiary into its own public, pure play metallurgical coal growth company as an alternative opportunity while also advancing the previously announced LoI to sell certain assets associated with its Deane Mining complex.

Coronado Supports BSU Mining Engineering Technology

Coronado Global Resources has announced a major multilevel expression of support for the Bluefield State University (BSU) Mining Engineering Technology program. Through the agreement, commencing in 2024, Coronado Global Resources will:

- Provide up to \$50,000 each year for direct scholarships to students in BSU's Mining ET program;
- Establish internship opportunities for qualifying students in the BSU Mining ET program;
- Provide additional support for curriculum development;
- Provide employees to serve as adjunct faculty in the Mining ET program and deliver industry-specific instruction to BSU students in the program; and
- Appoint employees to serve on the BSU Mining ET Program Advisory Board.

"As a graduate of the Mining Engineering Technology Program at BSU, I am excited that Coronado Global Resources and Buchanan Minerals are partnering with BSU to restore the Mining ET program," said Keith Sigmon, general manager, Buchanan Minerals. "This will ensure we meet the increasing global demand for metallurgical coal. Buchanan Minerals has operated successfully for more than 40 years, and a large reason for that success is the passion and preparedness of BSU graduates."

President Robin Capehart expressed her gratitude for the generous support and guidance from Coronado Global Resources and Buchanan Minerals for BSU's Mining Engineering Technology Program. "Our shared goal is to produce BSU engineering technology graduates for productive, rewarding careers in the mining industry," she said.



Nearly a dozen Bluefield State University Mining Engineering Technology graduates are employees of Coronado Global Resources' Buchanan Minerals. Pictured (front row, left-to-right) are: Jeff Harris, production foreman; Josh Fuller, asst. mine engineer; Keith Sigmon, general manager; Justin Neel, general maintenance supervisor; Chris Sturgill, environmental engineer; Jeff Hubbard, maintenance; and (back row, I-to-r) Sam Beavers, manager of maintenance; Quinton Justice, mine engineer; Chris Spieth, electrical engineer in training; Chris Mullens, respirable dust coordinator, and Josh Roberts, maintenance coordinator of hoists and fans.

Alpha Revises Full Year 2023 Guidance Downward

Citing logistics issues that affected exports, Alpha Metallurgical Resources recently released preliminary sales volumes and realizations for Q3 2023 and revised its full year 2023 guidance downward.

"Alpha's third quarter was negatively impacted by a number of factors that warrant an announcement to the market ahead of our earnings release on November 2," said Andy Eidson, CEO, Alpha Metallurgical Resources. "We have also tightened and adjusted our full-year guidance ranges for shipment volumes and met segment cost of coal sales to provide investors with additional visibility into how we expect the year to conclude. On top of some weather-related problems that caused vessel delays in the quarter, we experienced mechanical issues at DTA that hampered the ability to load and ship our coal. We expect to provide additional information soon regarding our analysis of DTA's long-range capital improvement needs to strengthen its efficiency and restore capacity lost to recurrent operational interruptions."

Alpha is reducing full-year 2023 metallurgical coal shipment guidance to a range of 14.8-15.2 million tons, down from the previous range of 15-16 million tons. The company is increasing volume guidance for the thermal coal to 500,000 to 700,000 tons, up from the prior range of 300,000 to 600,000 tons. These adjustments bring Alpha's total 2023 shipment guidance down to a range of 16.3-17.3 million tons across the entire organization, from the prior range of 16.3-18 million tons.

"Along with lower-than-expected shipment volumes in the quarter, we sold some lower-priced tons from the development areas at new mines during the pricing trough early in the quarter, which negatively impacted our average realizations for the period," Eidson said.

The company increased its met segment cost of coal sales guidance to a range of \$110/ton to \$113/ton, up

from the previous range of \$106/ton to \$112/ton.

"In light of the logistics challenges we have experienced throughout the year, we lowered our overall shipment volume guidance and tightened the ranges to reflect our expectations for the balance of the year," said Todd Munsey, CFO, Alpha Metallurgical

Monthly State From Coal Country

Resources. "Additionally, due to further investments in employee wages as well as the significant movement of the met coal indices, which directly impact sales-related costs, we are increasing our met segment cost of coal sales guidance for the full year."

——— U.S. News Continued on Page 10 ——

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Top 10 Coal-pr	oducing Stat	es and Regi	ons
(Thousands of Short T	ons)	Week E	nding (9/30/23)
	YTD '23	YTD '22	% Change
Wyoming	177,326	184,143	-3.7
West Virginia	66,628	63,056	5.7
Illinois	29,677	28,624	3.7
Pennsylvania	29,311	27,771	5.5
Kentucky	22,308	21,352	4.5
Montana	21,480	21,731	-1.2
Indiana	19,628	17,289	13.5
North Dakota	18,891	20,637	-8.5
Texas	10,811	12,628	-14.4
Colorado	9,013	9,832	-8.3
Appalachian Total	127,681	120,684	5.8
Interior Total	74,994	73,826	1.6
Western Total	240,091	253,887	-5.4
U.S. Total	442,766	448,397	-1.3

Weekly Spot Prices

(\$/ton)		Week E (10/6/23)	nding (9/8/23)
Central Appalachia	(12,500 Btu, 1.2 SO ₂)	\$74.35	\$70.00
Northern Appalachia	(13,000 Btu, < 3.0 SO ₂)	\$54.65	\$54.10
Illinois Basin	(11,800 Btu, 5.0 SO ₂)	\$47.75	\$50.00
Powder River Basin	(8,800 Btu, 0.8 SO ₂)	\$14.15	\$14.30
Uinta Basin	(11,700 Btu, 0.8 SO ₂)	\$31.90	\$32.35
Source: Energy Information	Administration		

Australian Court Dismisses Lawsuit Involving the Narrabri Project

A federal court sided with Australia's Minister for the Environment and Water, Tanya Plibersek, and her decision to authorize expansion projects proposed by Whitehaven Coal and MACH Energy Australia. Environmental activists brought lawsuits to force her to reconsider the climate risks posed by additional coal production. Whitehaven is looking to extend its Narrabri operation to 2044 and MACH Is looking to extend operations at Mount Pleasant until 2048.

Whitehaven Coal said it welcomed the Federal Court judgment on October 10, 2023, dismissing an application for judicial review proceedings brought with respect of two coal mine extension projects.

On June 2, 2023, the Environment Council of Central Queensland Inc, a 'green' group, commenced proceedings seeking to review a decision by the Federal Minister for the Environment and Water that the Narrabri Stage 3 Underground Mine would not be a substantial cause of the physical effects of climate change on World Heritage properties and other matters of national environmental significance. Whitehaven joined these proceedings in support of the Minister's case.

The judgment clears the way for the Minister to make a final determination in respect of the *Environment Protection and Biodiversity Conservation* (EPBC) application for Narrabri Stage 3, a project that is expected to extend the life of the mine from 2031 to 2044, support around 500 continuing jobs in New South Wales and entail a significant economic benefit to the state.

South Africa Breaks Up Coal-smuggling Gangs

During mid-October, the South African Revenue Service (SARS) conducted a massive intergovernmental search-and-seizure operation across five provinces to break the back of a sophisticated criminal syndicate of alleged coal smugglers, who played a major role in exacerbating the energy crisis and loadshedding from Eskom power plants. The government agency believes that it helped prevent the loss an additional R500-million (\$26.6 million), and discovered why the utility's performance was suffering so much.

The alleged coal smugglers and their related entities were active in Gauteng, Mpumalanga, KwaZulu-Natal, the Free State, and Limpopo. The suspects include former Eskom employees who facilitated procurement fraud, as well as other individuals involved in the diversion of high-grade coal.

Coal trucks destined for power stations were diverted to designated coal yards where high-grade coal is replaced with low-grade or sub-standard product. The highgrade coal is then exported or sold to willing buyers. The low-grade coal is often blended with scrap or other materials and then delivered to power stations. The low-grade coal damages the infrastructure at the Eskom power stations, which is a major factor in crippling the power utility's ability to generate electricity for the South African grid.



Future longwall panels mapped out for the Narrabri Stage 3 expansion will extend the life of the mine from 2031 to 2044. (Image: Whitehaven)

SARS Commissioner Edward Kieswetter commended the country's law enforcement agencies for this massive breakthrough in ongoing investigations. "It is because of such naked greed that the country has experienced unprecedented loadshedding, which harms business, undermines foreign direct investment and leads to job losses — all of which negatively affect revenue collection," he said.

Since the beginning of this year South Africa experienced some of its worst blackouts, where homes and businesses went without electricity for more than eight hours a day.

Germany Keeps Coal Online

The Associated Press recently reported that Germany will bring several mothballed coal plants back to the market this winter to ensure grid stability. Germany's economic ministry passed a law that will allow the renewed activation of coal-fired units belonging to RWE and Leag.

The ministry said that it would evaluate the additional carbon emissions caused by the reactivation of coal plants, and propose compensatory remedies by next summer.

The decision for this winter affects two units from RWE's Niederaussem plant and a unit from the Neurath plant. In the eastern Germany, Leag is expected to bring two unit at its Jaenschwalde lignite plant back online. The facilities were operational last winter, placed on standby in July, and can now be fully reactivated until March 2024, according to the Associated Press.

Asia-Pacific Continues to Build Coal-fired Capacity

The United Nations (U.N.) Economic and Social Commission for Asia and the Pacific (UNESCAP) filed a report recently saying that more than 180 gigawatts (GW) of coal-fired capacity are under construction, despite the U.N. calling urgently for an end to coal-fired generation. The commission noted that Bangladesh, Cambodia, China, India, Indonesia, Japan, Pakistan, the Philippines, South Korea, and Vietnam continue to build coal-fired plants. The report noted that the Asia-Pacific region is the largest coal user, accounting for about 80% of the world's consumption in 2021.

CIL Initiates Recruiting Efforts

Coal India Ltd (CIL) has launched a recruitment drive to address Prime Minister Narendra Modi's commitment to provide job opportunities to the youth while ensuring the welfare

— Worldwide News Continued on Page 11 —





DATELINE WASHINGTON

Germany's Coal Conundrum

By Conor Bernstein



Despite ongoing talk across Europe about weaning off coal, European coal-generated power production grew by around 9% in September. With winter cold approaching and

Europe's energy crisis far from over, that growth may well continue, and Germany, specifically, is once again turning to its coal fleet as an energy security failsafe. Germany's cabinet has decided, for the second year running, to bring several mothballed coal plants back online to buttress the rest of the nation's coal fleet to replace scarce natural gas and moderate prices during periods of peak demand. Germany's ongoing energy crisis has entered a new phase. Concern is less about will there be physical gas shortages but rather the extraordinary cost of gas and electricity prices and the related economic impacts.

While European gas and electricity prices have come down from their peaks during the height of the energy crisis, thanks largely to cratering demand, prices remain bitingly high. Wholesale electricity prices are more than triple what they averaged between 2010 and 2020.

And these high prices have walloped German industry. In little more than a year, the German economy has gone from powerhouse to slug. Germany is now the world's worst-performing major developed economy with the expectation that years of growth will be replaced by at least a year of economic contraction.

Picking the Wrong Bridge

German energy policy, which embraced cheap Russian gas in lieu of existing coal and nuclear capacity, created an extraordinary economic vulnerability.

In Germany's race to an idealized green future, it simply picked the wrong bridge with disastrous consequences. How different German and European energy security would have been if they had prioritized dispatchable fuel diversity, using some of the world's newest and cleanest coal capacity, instead of prematurely closing it and binging on Russian gas.

Coal rose to the occasion during Germany's hour of need, at times meeting nearly half of German power demand last winter. But the country seems determined once again to abandon energy pragmatism.

The Germans remain committed to completely phasing out their coal fleet by 2035, with significant retirements coming much sooner. Astonishingly, they have proposed building 25 GW of natural gas generating capacity in its place to backstop renewable intermittency. Instead of working to disentangle themselves from the volatility and energy insecurity of global gas markets, the Germans are proposing to deepen their reliance.

Germany is already facing deindustrialization from a year and a half of skyhigh energy prices with energy-intensive manufacturers shuttering or openly talking of relocating. And now the policy path forward seems to promise more pain.

American policymakers must learn from Germany's ongoing energy missteps. Energy security and affordability, underpinned by dispatchable fuel diversity, cannot be taken for granted. Or, worse yet, torpedoed by extraordinary short-sightedness and environmental zealotry.

Through its own policy miscalculations, the U.S. is racing towards energy supply shortages, overreliance on natural gas for dispatchable power and price shocks that could freeze any efforts to re-shore industry and rebuild our manufacturing base.

The stakes are enormous. Just ask German industry.

Conor Bernstein is a spokesperson for the National Mining Association, the industry's trade group based in Washington, D.C.

U.S. News Continued from Page 7 —

For 2024, the company has committed approximately 4 million tons of met coal at an average price of \$160.91/ton to domestic customers. Those tons include committed carryover tons from 2023.

X-BATT JV With CONSOL to Revolutionize Battery Technology

X-BATT, a company that specializes in advanced battery materials, is partnering with CONSOL Innovations, a subsidiary of CONSOL Energy Inc., to accelerate the development of its coal-based anode technology. The work will be performed by C-BATT Innovations LLC, a newly formed joint venture (JV) between the companies that is focused on advancing domestic battery materials derived from coal toward ultimate commercialization.

"Collaborating with a forward-looking energy leader like CONSOL propels our technology to the next level," said Bill Easter, CEO, X-BATT. "The ability to supplant graphite with an abundant, domestically sourced coal presents an eco-friendly solution for the growing demand for lithium-ion batteries."

Since 2020, in partnership with the Department of Energy, X-BATT said it has been at the forefront of this innovation, integrating coal with its proprietary, low-cost, resin-based technology to produce high-performance, domestically sourced anode materials.

"We continue to invest in the coalto-products sector," said Dan Connell, senior vice president of CONSOL Innovations. "This opportunity is focused on coupling abundant domestic raw materials with cutting-edge technology to unlock new sustainable uses for coal, and we are excited to team with X-BATT to pursue it further."

This JV stands as a testament to the converging forces of innovation and sustainability, Connell explained, and is poised to reshape the landscape of energy storage and battery technology. of citizens. Since the effort began in July 2022, CIL said it has issued a total of 7,268 appointment letters, surpassing the target of 3,969, representing an impressive growth of more than 83%. In August 2023, a total of 574 appointment letters were issued against a target of 465.

Northback to Explore Grassy Mountain

Northback Holdings Corp., a subsidiary of Hancock Prospecting, is planning to conduct a coal exploration program and has submitted an application to Alberta's energy regulator for a deep-drilling permit on the Grassy Mountain coal deposit near Blairmore, Alberta. The company, which was formerly known as Benga Mining Ltd., is reportedly planning to drill 46 holes during the 2023 and 2024 exploration seasons.

Worldwide News Continued from Page 9

In June 2021, a joint federal-provincial review panel denied Benga's permits needed to resume mining for metallurgical coal at Grassy Mountain. The company, along with two First Nations groups, requested an appeal of the decision and the request was denied.

Donkin Miners Wait for Approval to Restart

Morien Resources Corp. provided an update on the Donkin coal mine in Nova Scotia, which is owned and operated by Kameron Collieries LLC, upon which Morien has a 2% to 4% royalty interest.

On September 27, 2023, the Nova Scotia Department of Labor, Skills and Immigration (DOL), the province's regulator for the Mine, announced that an independent engineer has been contracted by DOL, via a 30-day contract, to complete a technical review of the Donkin mine. This review is actively underway.

Morien said it welcomes this effort by DOL to bring resolution to a 75-day Stop-Work Order at Donkin for a roof fall incident that occurred on July 15, 2023, that was subsequently ameliorated by Kameron on July 27 and where no workers were injured, nor any equipment damaged.

The roof fall occurred in one of Donkin's two access tunnels, which were installed at Donkin in the late 1980s by DEVCO, a former federal Crown corporation. In keeping with Kameron's safety protocols, it made a proactive decision to implement a comprehensive remediation program which included extensive roof bolting over the full length of the 3.5-km-long access tunnel to safeguard against future falls. That program commenced on July 19 and ended on July 27.



Find out more at www.gladiatormining.com +1.816.270.4700 | info@wireco.com



2023 U.S. Prep Plant Census

Operators add capacity to process future production

By Steve Fiscor, Editor-in-Chief



Allegheny Metallurgical's new 1,400-ton-per-hour (tph) prep plant loaded its first train during February 2023.

Coal markets softened during the summer of 2023, but activity continues on a steady course for most coal producers. Meanwhile, the medium- and long-term outlook for demand remains strong, especially for metallurgical coal markets. Those trends are reflected in Coal Age's 2023 U.S. Prep Plant Census. This year's tally identifies a total of 226 prep plants, 210 processing bituminous coal and 17 processing anthracite. A total of 73 bituminous prep plants are currently sitting idle, which puts the number of active bituminous plants at 154. Two plants were added and one plant was removed. Robindale Energy Services' Laurel prep plant and Corsa Coal's idled Rockwood plant, which were overlooked in the past, were added this year. Both are bituminous plants in Pennsylvania. American Consolidated Natural Resources' Galatia prep plant in southern Illinois was demolished during 2022. Knowing idled prep plants may reopen and permits remain active, *Coal Age* carries prep plants in the census until they are demolished.

West Virginia leads with 46 active bituminous prep plants, followed by Kentucky (25), Pennsyl-

vania (21), Virginia (13), Illinois (11) and Alabama (7).

Allegheny Metallurgical commissioned its High Carbon Processing prep plant in West Virginia during January. America's newest facility, a 1,400-ton-per-hour (tph) greenfield plant, loaded its first train during February 2023. Longwall production is expected to begin soon.

CONSOL Energy commissioned its Itmann prep plant in West Virginia during December 2022. At the time, the mine was having problems securing enough room-andpillar mining equipment to reach its expected design capacity. More recently, CONSOL Energy reported that the Itmann mine has transitioned from the development phase to operations, and the ramp up to full run-rate production was nearing completion. During the first half of 2023, the Itmann Mining Complex produced 134,000 tons of coal and sold 234,000 tons of Itmann and third-party coal in aggregate.

2023 U.S. Pre	p Plar	nt Ce	nsus S	ummary			
States I	Plants	Idle	Active	Operators	Plants	s Idle	Active
Alabama	8	1	7	Alliance Resource Partners	13	7	6
Colorado	5	2	3	Alpha Metallurgical Resources	10	2	8
Illinois	11	2	9	American Resources Corp.	9	3	6
Indiana	12	7	5	ACNR & Affiliates*	18	7	11
Kentucky	57	32	25	Arch Resources	5	0	5
Maryland	1	0	1	Blackhawk Mining	12	2	10
Montana	1	0	1	Bluestone Resources	13	10	3
Ohio	8	4	4	Knight Hawk	4	0	4
Pennsylvania (A)	17	0	17	Peabody Energy	5	0	5
Pennsylvania (B)	21	3	18	Rosebud Mining	7	0	7
Tennessee	3	1	2				
Utah	3	0	3				
Virginia	18	5	13	*Note: ACNR = American Consolida	ated Nati	ural Re	sources,
West Virginia	62	16	46	affiliates include Foresight Energy (IL), Muh	lenberg	County
Total	227	73	154	(KY), and Belmont County (OH).			

Ramaco Resources successfully completed the expansion of the processing capacity at its Elk Creek prep plant during Q3 2023. The \$9 million project to boost production from 2.1 million tons per year (tpy) to 3 million tpy took more than a year to complete. The company said it expects by year end that it will have continuous operation at a 3-million-tpy run rate, which was first achieved during July 2023.

In August and September, the company reported that costs at the Elk Creek complex declined to just under \$100/ton. For Q4 2023, given the increased capacity at the Elk Creek plant, the company anticipates that the mine costs will decline further.

The company had built more than 1 million tons in inventory during the first half of 2023 in anticipation of the increased processing capacity at the Elk Creek prep plant. The company said it is now in the process of converting this inventory to cash, which based on committed sales will show significant impact in Q4 2023.

As this edition was going to press, American Resources announced a plan to sell its coal operations. In April, the company said it had commissioned its McCoy Elkhorn processing facilities in Pike County, Kentucky. The McCoy Elkhorn processing complex has two onsite, state-of-the-art processing facilities, one with a 500-tph raw feed capacity and one with an 800-tph raw feed capacity, a unit train rail loadout on the CSX railway and two extensive refuse impoundments that have significant life and storage capacity.

Coronado Global Resources is adding coal storage capacity to the Buchanan prep plant in Virginia to accommodate additional coal from its expansion project, which includes adding a second longwall. That project was expected to be completed during Q4 2023.

Warrior Met began construction on its Blue Creek Complex, a new longwall installation, prep plant and coal handling facility. The company said the Blue Creek project remains on schedule with the first development tons from continuous miner units expected in Q3 2024 and the longwall scheduled to start up in Q2 2026.

The company estimated capital expenditures in 2023 for the devel-

opment of the Blue Creek mine to be approximately \$250 to \$300 million and it recently said the facility is "advancing at a robust pace." With nearly 70 million tons of recoverable reserves, Warrior Met said the Blue Creek mine will provide access to one of the largest untouched metallurgical coal reserves in North America for the next 50 years.



U.S. Prep Plant Census 2023 Continued

					Year of		Primary Sep.	Intermediate Sep.		_	Online		_	
Company	Plant Name	Raw Feed	Product Ash %	Quality	Last Upgrade	Type of Plant HM WO	HM Jig Ves. Cycl.	LD HM WO Cycl. Cycl. Tables	Fine Coal Froth Spiral Column	Centrifugal Dryer(s)	Analyzers E M A	Controls Man. PLC DCS	Builder	Year
					:									
Alabama (8)														
Best Coal	Short Creek	I	I	I			 					 	I	
Bluestone Resources	Glade	200	I	I		•	•	 	•	•	 	 • 	Tag	2012
Camellia Met Mining	Piney Woods	300	I	I	I	•	 	 •	•	•		 •	I	I
Crimson Oak Grove	Concord	1,000	8.50%	< 1.0	2011	•	• 1	 •	•	•	 	•	R&C	2011
Peabody Energy	Shoal Creek	2,220	12.00%	< 1.2	I	•	•	•	 •		 	 • 	R	1992
Warrior Met Coal	JWR No. 4	1,300	Ι	I	2010	•	•	 •	•	•	 	 • 	Mc/Tag	1974
Warrior Met Coal	JWR No. 5 (Idle)	1,000	Ι	I	2008	•	•		•	•		 • 	Mc/Tag	1976
Warrior Met Coal	JWR No. 7	1,400	Ι	I	2012	•	• 1	 	•	•	•	 • 	Mc/Tag	1978
Colorado (5)														
Allegiance Coal	New Elk (Idle)	600	I	< 1.2	2012	•	•	 • 	•	•	• •	 • 	I	I
Arch Resources	West Elk	700	I	I	I	•	 • 			•	 	 • 	Tag	2010
Blue Mountain Energy	Deserado	800	8.00%	< 1.2	2017	•	•	 • 	•	•	•	 • 	Mc	1983
Peabody Energy	Twentymile	2,000	I			•	•	 • 	•	•	•	•	Tag	2008
Wolverine Fuels	Bowie (Idle)	650	5.50%	< 1.2	I	•	•	•	•	•	• 1	 • 	Dan	2004
Illinois (11)														
Alliance Resource Partners	Hamilton County	2,000	I	Ι	I	•	•	 • 		•	 	 • 	GMC	2013
Alliance Resource Partners	Pattiki (Idle)	1,200	7.00%	> 2.5	2003	•	•	 •	•	•	• • •	 •	FMC	1982
Foresight Energy	Deer Run	2,000	9.00%	> 2.5		•	•	•	•	•		 • 	CDG	2011
Foresight Energy	Pond Creek-Mach	2,250	7.80%	2.5	2022	•	•	•	•	•	 • 	•	CDG	2006
Foresight Energy	Shay (Idle)	850	8.00%	3.5	2009	•	•	•	•	•	 	 • 	Mc	1970
Foresight Energy	Sugar Camp	4,200	9.00%	2.5	2014	•	•	•	•	•		 • 	CDG	2011
Knight Hawk Coal	Creek Paum	550	Ι	I	I	•	•		•	•		 • 	Tag	2000
Knight Hawk Coal	Prairie Eagle	850	I	I	2012	•	•	 • 	•	I	 • 	 	Tag	2005
Knight Hawk Coal	Red Hawk	250	Ι	I	I	•	 •			I		 	1	I
Knight Hawk Coal	Viper	700	9.00%	> 2.5	2015	•	•	 •	•	•		•	R&S	1982
Peabody Energy	Gateway	1,000	I		1998	•	•	 	•	•	 	 • 	R&S/Tag	1976
Indiana (12)														
Alliance Resource Partners	Gibson County North (Idle)	950	I	1.2-2.5	2014	۱ •	•	1 1 1	 • 		 •	 • •	Dan	2000
Alliance Resource Partners	Gibson County South	2.000	I	1.2-2.5	I	•	•	•	•	•		•	GMC	2014
Blackhawk Mining	Augusta (Idle)	250	Ι	> 2.5	2010	•	 •		•	•	 	 •	ථ	2002
Blackhawk Mining	Freelandville No. 2 (Idle)	400	8.00%	> 2.5	2010	•	•		•		 	 •	°C	2005
Blackhawk Mining	Log Creek (Idle)	600	8.50%	> 2.5	I	•	•		•	•		 • 	Dan	2011
Lexington Coal Holdings	Kindill No. 2 (Idle)	1,200	Ι	I	I		 					 	R&S	1951
Lexington Coal Holdings	Sycamore (Idle)	400	10.50%	> 2.5	1997	•	•	 • 		•		 •	CPE	1982
Peabody Energy	Bear Run	1,600	I	I	I	•	• 1	 • 	•	•	 •	 • 	Tag	2010
Peabody Energy	Francisco	650	Ι	I	2008	•	 • 	 •	•	•	 •	 • 	Dan	1997
Solar Sources	Carbondale	400	Ι	I	1985	•	 • 	 •		I	 •	 	Dan	1985
Sunrise Coal	Carlisle (Idle)	006	I	> 2.5	I	•	•	•	•	•		 • 	Dan/ACS	2007
Sunrise Coal	Oaktown	1,600	I	> 2.5	2016	•	•	 • 	•	•	• • •	 • 	Pow	2008
Kentucky (57)														
Alliance Resource Partners	Dodge Hill (Idle)	300	- 000	4 C		 •	• 	 • 	 •	•	 	 • 	-	- 100
		7 200	0.00.0	C.7 <		•	•	•	•	•	 	•		1102
Alliance Resource Partners	Elk Creek (Idle)	1,200	8.00%	C.2 <	- 1001	। • ·	•	 • •	• •	•	 	 • •	GMC	2006
		1,000	0/.00.0	> 1.7	1661	•	•	 •	•	•	 	•		19/4
Alliance Resource Partners	Onton No. 9 (Idle)	00/	- 000		1102	•	•	 •	•	•	 	•	- RMC	2004
Alliance Resource Farmers Alliance Resource Partners	Folluki (Iule) River View	3 000	<i>%</i> .00.0	<pre>>1:2</pre>	2015								GMC	2009
Alliance Decentros Dectant	Womion	1 200		2	0107							•	CMC	0007
American Decourace	Parry County	1,250	7 5002	 	I		 •	 • •			 •	 • •		1070
Allelicali Nesoul Ces	reny county	00001	0/. OC' /	C-7-7-1			 •			,		•	NULTOW	6/61
-	-	-		-	-				_	_	-		_	_

_	_	_	-	_	Year of		Primary Sen.	Intermediate Sen.		_	Online		_	
Comments	Blood Norro	Raw	Product		Last	Type of Plant	MH The second s	OM WH OT	Fine Coal	Centrifugal	Analyzers E M A	Controls Man DI C DCC	Durklen	Voor
6 m duoo			2 197	· · · ·	o her mo		ndo m. Su		mino mile more					
American Resources	Supreme (Idle)	450	10.00%	< 1.2		•	 • 	•	•	•	 	•	I	I
American Resources (Deane)	Mill Creek	800	8.00%	< 2.5	I	•	 • 	•	•	•	 	 • 	R&S	1992
American Resources (McCoy Elkhorn)	Bevins Branch	1,350	8.50%	1.2-2.5	2010	•	 • 	•	•	•	 	 •	I	1980
A nev Energy (James H Booth)	Ria Creek	450	I	I	I	•		•	•	•			Pow	I
Annalchian Resource Co	Rob Fork	9009	I	I	I	•		1		I			Pow	I
Blackhawk Mining	Blue Diamond No. 64 (Idle)	006	7.00%	1.2-2.5	2010	•	 •	•	•	•		 •	Dan	1989
Blackhauk Mining	Lastharwood	1 000	7 000	1 2 2 5	2006	•	•	•	•	•		•	D.8.5	1000
Blue Gem Mining	Blue Gem (Idle)	000,1	201											
Diversion Metural Decouraci	Conto Bronch	1 800				•	•					•		
Bluegrass Natural Resources		1,800	I	I	000	•	•	•	•	•	 	•	I	I
Bluestone Kesources	Evanston (Idle)	400	I	I	/007	•				I	 		I	I
Bluestone Resources	Jones Fork (Idle)	00	I	I	2011	•	 	•		I	 	 	I	I
Bluestone Resources	Licking River (Idle)	300	I	I	I	•	 	 		Ι	 	 	I	2007
Bluestone Resources	Pine Mountain (Idle)	400			2010	•	 	 		I	 	 	I	I
Cambrian Coal	Bear Branch (Idle)	400	I	I	I	•	 • 	 •	•	•	 	 •	Pow	I
Cambrian Coal	Beech Fork No. 1 (Idle)	500	I	I	I	•	 • 	 •	•	•	 •	•	Pow	I
Cambrian Coal	F.M. Burke (Idle)	550	8.50%	1.2-2.5	1994	•	 • 	•	 •	•	 	 •	Liv	1980
CBD Resources	Raven (Idle)	800	10.00%	< 1.2	208	•	 • 	•	•	•	 •	 • 	Pow	2008
Harlan Cumberland Coal	Highsplint (Idle)	1,200	I	I	I		 	 	 	Ι	 	 	I	I
Harlan Cumberland Coal	Totz	600	2.00%	< 1.2	I	•	 • 	•	I I I	•	 	 •	Dan	1976
JRL Energy	Coalgood	I	I	I	2019	•	 • 			Ι	 	 	Pow	I
Kentucky Proc. & Equp.	Pleasant View (Idle)	006	I	I	I		 			I		 	I	Ι
Kingdom Coal	Enterprise - Roxana	875	9.00%	1.2-2.5	2009	•	•	•	• •	•	 	 •	A&T	1980
Lexington Coal Co.	Long Fork (Idle)	1,500	I	Ι	2002	•	•	 •	•	•	 	•	Pow	1979
Lexington Coal Co.	Martin County (Idle)	1,400	I	I	I	•	 • 	•	•	•	 	 • 	Dan/Pow	1972
Lexington Coal Co.	Sidney - Big Creek (Idle)	1,500	I	I	1661	•	 • 	 •	•	•	 	 • 	R&S	1989
Lipari Energy	Pioneer	350	I	I	2010		 •	 		Ι	 	 	I	I
Metinvest	Sapphire	1,100	8.00%	I	2006	•	 • 	 •	•	•		 • 	Mc	1982
Muhlenberg County Resources	Genesis (Idle)	1,200	8.50%	> 2.5	I	•	• 1	•	•	•	 •	 • 	GMC	2009
Muhlenberg County Resources	Midway	1,200	8.50%	> 2.5	I	•	• 1	 •	•	•	 •	•	GMC	2008
Muhlenberg County Resources	Paradise No. 9 (Idle)	800	8.00%	> 2.5	2011	•	• 1	 •	•	•	 	•	Bays	2004
Muhlenberg County Resources	Pride	009	8.50%	> 2.5	2021	•	• 1	 •	•	•	• 1	•	GMC	2009
Nally & Hamilton Enterprises	Brookside (Idle)	1,200	I	I	I		 				 	 	I	1968
NewLead Holdings	Coal Essence	Ι	I	I	I		 			I		 	I	Ι
Oxford Mining Co.	Schoate	I	I	I	I	I I	 	 	I I I	I	 	I I I	I	I
Paringa Resources	Poplar Grove (Idle)	400	I	I	I		 			I	 	 	I	Ι
Pinnacle Processing	Pevler (Idle)	I	I	I	I	I I	 	 	I I I	I	 	I I I	I	I
Prairie Mining Co.	Highland (Idle)	2,000	9.50%	> 2.5		• •	 •	•		•	 •	 •	R&S	1981
Pristine Clean Energy	Premier Elkhorn	1,100	I	I	I	•	 • 	 •	•	•	 •	•	Pow	I
Revelation Energy	Bell County-Hignite (Idle)	650	8.50%	1.2-2.5	2009	•	 • 	•	•	•		 • 	Dan	1980
Revelation Energy	Bledsoe No. 1 (Idle)	650	8.00%	1.2-2.5	2009	•	 • 	•	•	•	 	 	Peters	1985
Revelation Energy	Red Bird (Idle)	500	I	Ι	Ι	I I	 	I I I	I I I	I	 	I I I	I	Ι
Revelation Energy	Shamrock Beechfork (Idle)	1,400	8.50%	1.2-2.5	2010	•	 • 	 •	•	•	 	 • 	Pow	1990
Richmond Hill	Clintwood Elkhorn No. 2	650	I	I	I	•	 • 	•	•	•	 •	•	Pow	Ι
Sequoia Energy	Sequoia	750	I	Ι	Ι	I I	 	I I I	I I I	I	 	I I I	Pow	Ι
Tahita Energy, Inc.	Spurlock (Idle)	900	I	I	I	•	 • 	•	•	•	 	 • 	Tag	2007
Tahita Energy, Inc.	Ivel (Idle)	500	I	I	2007	•	 • 	 •	•	•	 	 • 	Tag	I
Vision Mining	Vision No. 9 (Idle)	250	I	I	2004		 	 	 	Ι	 	 • 	Erwin	I
Western Kentucky Minerals	Joe's Run Processing	I	I	I	I	T T	 	 	 	I	 	I I I	I	I
Maryland (1)														
Alliance Resource Partners	Mettiki	1,350	I	I	I	 	 	•		I	 	 	Mc	1978

		;			Year of		Primary Sep.	Intermediate Sep.	, ;		Online			
Company	Plant Name	Feed	Ash %	Quality	Upgrade	HM MO	Jig Ves. Cycl.	Cycl. Cycl. Tables	Froth Spiral Column	Dryer(s)	E M A	Man. PLC DCS	Builder	Year
Montana (1)														
Signal Peak Energy	Black Otter	2,000	I	I	2017	•	•	1 1 1	 • 	•	 	 • 	Tag	2009
Ohio (8)														
ACNR	Star Ridge (Idle)	425	8.00%	> 2.5	I	۱ •	• 	 •	 • 		 	 • 	LCE	2007
Belmont County Coal (ACNR)	Century (Idle)	3,000	8.50%	> 2.5	2012	•	•	 •	•	•	 	 • 	A&T/LCE	2002
Oxford Mining Co.	Conesville (Idle)	800	I	I	2015	•	 •	•	 •	Ι	 	 	NH/ACS	1984
Kimble Clav & Limestone	Stonecreek	I		I	I					I			I	I
I secville I and	Nelms	I	I	I	I			1		I			I	I
Carbon Diver Coal	Conde Hill	300						•						
Rosebud Mining	Tusky	300	8 50%	275			•		 •	•		 •	Tao	2008
State I ine Recontroec	Negley (Idle)	200	201			•	•	•		•			40 11	
Pennsylvania-Anthracite (17)	116210J (1010)	004												
Atlantic Coal	Stockton	I	I	I	I		1		1	I		 	I	I
Black Creek Breaker Co	Black Creek	I	I	I	I			1		I			I	I
Blaschak Anthracite	Blaschak	200	9.00%		2021	•	•		•			 	Wil	1947
Blaschak Anthracite	Latimer	200	8.00%	Ι	2011	•	•		•	I	 	 • 	Lin	1975
Calvin V. Lenig	Coal Prep	I	I	I	I		 			Ι	 	I I I	I	Ι
Carbon & Metal Tech	Pine Creek	I	I	I	I		 	 	1	Ι	 	 	I	I
D Dale Lenig	Dale Lenig	I	I	I	I		 	 		I	 	 	I	Ι
Gale Mining Co.	Ginther	I	I	I	I			 	1	Ι	 	 	I	I
Lehigh Anthracite	Greenwood	300	I	I	I	•	•	 •	•	I	 	 	Wil	1962
Lenig & Kosmer	Glenn Lenig	I	I	I	I		 	 		I	 	 	I	I
Meadowbrook Coal Co.	Meadowbrook	I	I	I	I			 	1	Ι	 	 	I	I
Molesevich & Sons Construction Co.	Atlas	I	I	I	I						 	 	I	I
PAC 23 Mining Co	Split Vein	I	I	I	I		 			Ι	 	I I I	I	I
Reading Anthracite	New St. Nicholas	1,000	I	I	I			 	1	Ι	 	 	I	1963
Schuylkill Coal	Schuykill	I	Ι	Ι	Ι		 			Ι	 	 	Ι	Ι
Sherman Coal Co.	Sherman	I	Ι	I	I		 			I	 	 	I	Ι
Superior Coal Prep	Superior	I	I	I	I		 			I	 	 	I	I
Pennsylvania-Bituminous (19)														
ACNR	Eighty Four (Idle)	1,000	7.00%	< 2.5	I	ו •	 • 	 •	•	•	• • •	 • 	F&P	1996
CONSOL Energy	Bailey Central	8,200	8.00%	< 2.5	2013	•	 • 	 •	•	•	• •	• • I	R&S	1983
Corsa Coal	Cambria	325	< 9.00%	< 1.2	I	•	• 1	•	•	•	 	 • 	Tag	2009
Corsa Coal	Rockwood (Idle)	325												
Corsa Coal	Shade Creek (Idle)	450	< 12.00%	< 1.8	2008	•	•	•	•	•	 	 • 	Tag	1966
Homer City Processing	Homer City	1,200	12.00%	< 2.5	1996	•	• 1	•	•	•	•	•	Н&Р	1978
ICS Energy Group LLC	Wilson Creek	400	6.00%-9.00%	< 1.2	I	•	• 1		•	•	 	 • 	Tag	2011
Iron Senergy	Cumberland	1,600	8.25%	> 2.5	1996	•	 • 	•	•	•	•	 • 	Dvo	1978
Jericho Fuels	Tipple 4J	I	I	I	I	I I	 	 	1	I	 	 	I	I
Jill Mining	Cannard Tipple	1	I	I	I		 			I	 	 	I	I
Original Fuels	Original Fuels	000	I	I	I		 				 	 	I	I
Piuer Hill Cool	They creek (tute)	350	00 <i>0</i>	;	- 000		 			I	 	 	I	- 1076
		000	0.00.0	4 C	0007	•					 		I e	0/21
Kobindale	KES Plant	300	8.00%	< 1.2	000	•	•		•	•	 	 • 	lag	2012
Kobindale	Laurel	400		.	2023	•	•		•	•	 	 • 	8077H	6107
Kosebud Mining	Clymer	C17	%C/.8-%UC.0	212	7707	•	•	•	•	•	 	 '	I	0/61
Kosebud Mining	Crooked Creek	000	%0C8-%0C1	7 C	7707	•	•		•	•	 	 • 	(0707
Rosebud Mining	Lutch Kun	200	%C/.8-%UC.0	217	1102	•	 • •	•	•	•	 	 •	S	1076
	Lady Jane	005	2%C1.8-2%UC.0	7 I V	CUU2	•	•		•	•	 	•	I	0/61
	Mille / 0	000	2%C1.8-2%UC.0	7 I V	/107	•	•	 • ·	•	•	 	 • ·		2002
Kosebua Mining	Ponage	NUC	a%C1.0-0%UC.0	7 I 7 V	/107	•	 •	 • 	•	•	 	 • 	MIC	7161

		_			Year of		Primary Sep.	Intermediate Sep.			Online			
Company	Plant Name	Raw Feed	Product Ash %	Quality	Last Upgrade	Type of Plant HM WO	HM Jig Ves. Cycl.	LD HM WO Cycl. Cycl. Tables	Fine Coal Froth Spiral Colunn	Centrifugal Dryer(s)	Analyzers E M A	Controls Man. PLC DCS	Builder	Year
Tennessee (3)														
Bluestone Resources	Baldwin (Idle)	400			2012	ו •	1 1 1	1 1 1	 •	I	 	1 1 1	I	I
Kopper Glo Mining	Kopper Glo	I	I	I	I	I	 	 		I	 	 	I	Ι
Mountainside Coal Co.	Mountainside	I	I	I	I	I	 	 		I		 	I	Ι
Utah (3)														
ACNR	West Ridge	600	I	I	I	I I	 	 		I	 	 	I	I
Wolverine Fuels	Castle Valley	500	11.00%	I	2005								Centry	2005
Wolverine Fuels	Hunter	Ι	Ι	I	Ι	I I	 	 		Ι	 	 	I	Ι
Virginia (18)														
Alpha Metallurgical Resources	McClure River	1,100	6.75%-12.00%	< 1.2	2019	•	 • 	 •	•	•	 	• • •	Dan/Pow	1979
Alpha Metallurgical Resources	Toms Creek	1,100	7.00%-12.00%	1.2-2.5	2004	•	 • 	•	•	•	 	 • 	Dan/Tag	1980
Bluestone Resources	Ramsey (Idle)	650	I	I	2011	•			 •			 	I	Ι
Bluestone Resources	Sigmon (Idle)	400	I	I	2010	•			 •			 	I	Ι
Coking Coal LLC	Pardee	750	8.20%	< 1.2	2005	•	•	 • 	•	•	 •	 • 	Pow	1995
Coronado Coal	Buchanan	1,300	5.00%	< 1.2	2007	•	 • 	 •	•	•	 •		IE	1984
G&B Processing	No. 1 Tipple	I	I	I	I							 	I	Ι
INMET Mining	Lone Mountain (Idle)	1,150	6.00%	< 1.2	2004	•	•	 •	•	•	•	 • 	Pow	1981
INMET Mining	Pigeon Creek (Idle)	1,400	I	I	I	•	 • 	 •	•	•		 • 	Pow	I
Maven Energy	Maven No. 1	Ι	Ι	I	I		 			Ι		 	I	Ι
Metinvest	Nora	400	8.00%	I	I	•	•	 •	 •	•		 •	Pow	1981
Metinvest	Wellmore No. 8	1,000	7.00%	I	2011	•		•	•	•		 • 	Pow	1978
Ramaco Resources	Amonate (Idle)	600	5.00%	< 1.2	I	•	•	 •	 •	•		• •	°C	1978
Ramaco Resources	Knox Creek	650	I	I	2010	•	•	 •	•	•		 •	Pow	1978
Red River Coal	Red River No. 1	I	I	I	I							 	Poe	Ι
Red River Coal	Stoker	I	I	I	I					I		 		I
Richmond Hill	Clintwood Elkhorn No. 3	650				•	•	•	•	•	•	•		
SunCoke Energy	Coronet Jewell	006	6.80%	< 1.2		•	•	•	•	I	•	•	Liv	
West Virginia (62)														
Active Resources	Hampden	600	< 4.00%	< 1.2	I	•	 • 	 •	•	•		 •	Peters	I
Allecheny Metallurgical	High Carbon Processing	1 400	7 50%	105	I	•	•	•	•	•	 •	•	Pow	2003
Alliance Resource Partners	Tinnel Ridge	1 800	8 00%	00.1		•	•		•	•		 • •	Tao	2010
Alpha Metallurgical Resources	Century		I	I	I							 	Pow	2022
Alpha Metallurgical Resources	Homer III/Black Castle (Idle)	800	13.00%	< 1.2	2008	•	•	 •	•	•		 • 	Pow	2008
Alpha Metallurgical Resources	Kepler	750	6.50%	< 0.75	2013	•	 • 	 •	•	•	•	 •	Н&Р	1968
Alpha Metallurgical Resources	Kingston	700	6.50%	0.8	2001	•	•	 •	•	•	•	 • 	I	1974
Alpha Metallurgical Resources	Litwar (Idle)	450	5.50%-6.00%	I	2010	•	 • 	 •	•	•		 •	Liv	1980
Alpha Metallurgical Resources	Mammoth	1,100	13.50%	0.8	2008	•	 • 	 •	•	•		 • 	I	1950
Alpha Metallurgical Resources	Marfork	2,400	6.75%	< 1.2	2019	•	•	 •	•	•		 • 	Pow	1994
Alpha Metallurgical Resources	Power Mountain	1,200	7.50%	< 1.0	2010	•	 • 	 •	•	•		 • 	R&S/Pow	1985
Alpha Metallurgical Resources	Rum Creek/Bandmill	1,200	7.75%	< 1.1	2010	•	 • 	 •	•	•		 • 	Pow	2010
ACNR	Harrison County	1,500	10.00%	> 2.5	I	•	 • 	•	•	•	 •	 • 	F&P	2006
ACNR	Marion County	1,400	8.50%	> 2.5	Ι	•	•	 •	•	•	 	 • 	Far	1970
ACNR	Marshall County	2,800	9.50%	> 2.5	I	•	 • 	•	•	•	 •	 • 	F&P	2002
ACNR	Monongalia County (Idle)	1,500	8.00%	> 2.5	2000	•	•	 •	•	•		•	Liv	1970
ACNR	Ohio County	1,800	9.50%	> 2.5	2015	•	 • 	•	•	•	 •	 •	°	1967
Arch Resources	Beckley	600	7.50%	< 1.0	2018	•	 • 	 •	•	•	•	 • 	Pow	2007
Arch Resources	Cardinal	1,400	7.00%	< 1.05	2015	•	 • 	 •	•	•	 •	 • 	IR	2006
Arch Resources	Leer	1,400	7.00%	< 1.05	2012	•	• 1	 •	•	•	 •	 • 	Pow	2012
Arch Resources	Sentinel	1,600	7.50%	< 1.1	2021	•	 • 	 •	•	•	 	 •	R&S/Pow	1972
Argus Energy (Cliffs)	Kiah Creek (Idle)	400	I	I	I	•	 • 	I I I	 	Ι	 	I I I	I	Ι
Award Development	Slaughter Creek (Idle)	I	I	I	I	I I	 	 	 	Ι	 	 	I	Ι

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					Year of		Prin	nary Sep.	Intermed	iate Sep.				Online					
		Raw	Product		Last	Type of Plant		ΗM	ED H	OM F	Fin	e Coal	Centrifugal	Analyzers	<u> </u>	ontrols			
Company	Plant Name	Feed	Ash %	Quality	Upgrade	OM MH	Jig	Ves. Cycl.	Cyd. Cy	cl. Tables	Froth S	oiral Column	Dryer(s)	EMA	Man.	PLC D	CS Build	er Year	
Bay Star Coal Co.	Big Creek	I	I	I	I	I I	I	I I	I	I	Ι	I	I			I		I	
Blackhawk Mining	Blue Creek	006				•	I	•	I	I	Ι	•	•	 		•	- Tag	2009	
Blackhawk Mining	Fanco (Idle)	650	10.00%	< 1.2	2004	•	I	 •	•	I	Ι	•	•	•	I	•	- Broo	ks 1994	
Blackhawk Mining	Kanawha Eagle	800	6.00%	< 1.2	2001	•		•	•	I	Ι	•	•			•	- Tag	2000	
Blackhawk Mining	Katie	400	7.00%	< 1.2	2008	•	I	•	•	I	•	•	•			•	- Tag	1980	
Blackhawk Mining	Panther	1,200	10.00%	< 1.2	2005	•		•	•	I	•	1	I			•		1996	
Blackhawk Mining	Rocklick	2,800	%00.6	1.2-2.5	2000	•		•	•	1	•	•	•	• 		•	- R&	S 1986	
Blackhawk Mining	Toms Fork	700	13.00%	1.2-2.5	2004	•	I	•	•	I	Ι	•	•	•		•	- Dan/P	ow 1995	
Blackhawk Mining	Wells (Idle)	1,200	8.00%	1.2-2.5	2000	•	I	•	•	I	•	1	•	• 1	•	•	– R&	S 1978	
Bluestone Resources	Bishop	650	8.00%	I	I	•		•		I	•	•	•			•	- Tag	2013	
Blackhawk Mining	Katie	400	7.00%	< 1.2	2008	•	I	•	•	I	•	•	•			•	- Tag	1980	
Bluestone Resources	Keystone No. 1 (Idle)	400	Ι	Ι	2004	•	I	•	•	Ι	•	•	•			•	- Tag	2007	
Bluestone Resources	Keystone No. 2 (Idle)	450	I	I	I	•	I	•	•	I	•	•	•			•			
Bluestone Resources	Pinnacle	1,250	I	I	2019	•	•	•	•	I	•	1	I	•		I	- A&	1	
Bluestone Resources	Red Fox (Idle)	300	I	I	I	•		•	•	I	I	•	•	•		•	- Tag	2006	
Condor Holdings LLC	Holden 22	550	11.00%	< 1.2	2005	•		•	•	I	I	•	•	•		•	– Liv	1	
CONSOL Energy	Itmann	600	8.00%	< 1.0	I	•		•	•	1	•	•	•			•	- Rav	/ 2022	
Coronado Coal	Mountaineer Pocahontas	600	I	I	2012	•		•		1	•	•	•			•	- Tag	2007	
Coronado Coal	Saunders	006	I	I	I	•		•	•	1	Ι	•	•			•	- Tag	2009	
Edwight Processing LLC	Goals (Idle)	600	6.00%	I	2001	•		 •	•	I	•	•	•			•		I	
ERP Environmental Fund	Big Mountain (Idle)	006	12.00%	< 2.5	1998	•		•	•	1	•	•	•			•		1975	
Frasure Creek Mining (Essar)	Deep Water	Ι	I	I	I					1	I	1	I			I		I	
JSW Steel	Caretta	500	I	I	I					1	I	1	I			I	- Dai	1 2017	
Lexington Coal Co.	Black Bear	1,800	6.20%-9.10%	< 1.2	2004	•	I	•	•	I	•	•	•	•		•	– R&	\$ 1992	
Lexington Coal Co.	Sprouse Creek (Idle)	1,400	Ι	Ι	I	•	I	•	•	I	•	•	•			•	- Dan/P	ow 1978	
Metinvest	Affinity	550	8.00%		I	•	I	•	I	I	•	•	•	 		•	- Tag	2011	
Metinvest	East Gulf	600	6.75%	Ι	2007	•	I	•	•	I	•	•	•	 	•	•	- R&S/F	ow 1952	
Metinvest	Star Bridge	500	9.00%	Ι	I	•	I	I I	•	I	•	•	•	 		•	– Ind	2006	
Phoenix Federal No. 2	Federal No. 2 (Idle)	1,300	6.70%	1.2-2.5	1998	•		•	•	Ι	•	I	•	•		•	- R&	S 1968	
Prime Processing (Cliffs)	Eckman	500	I	I	2011	•		•	•	I	•	•	•	•		•	- Tag	2007	
Pocahontas Processing LLC	Delbarton	600	8.50%	< 1.0	1984	•		•	•	I	•	•	•			•	- Goff I	sro 1974	
Ramaco Resources	Elk Creek	700	I	I	I	•		•	•	1	•	•	•			•	- Rav	2017	
Rhino Resource Partners	Tug Fork	1,800	< 10.50%	> 1.0	2000	•		•	•	1	I	•	•		•	•	- Pov	/ 1981	
Southeastern Land	Miller Creek	800	12.00%	< 2.0	2006	•		•	•	I	I	•	•			•		I	
Southeastern Land	Peach Orchard (Idle)	550	12.00%	< 1.2	I	•		•	•	I	I	•	•	•		•	- I ^{-/}	1994	
Superior Processing	Superior	Ι	Ι	I	I				I	I	Ι	I	Ι			I		I	
White Forest Resources, Inc.	Raven Crest - Bull Creek	300	8.00%-10.00%	< 1.2	I	•		•	•	I	I	1	•			•	- ACS/F	aw 2013	
White Forest Resources, Inc.	South Fork - Clearco	300	6.50%	0.8 - 1.1	I	•		•	I	I	Ι	•	•			•	– Dai	1 2013	
XMV (Cliffs)	Black Wolf (Idle)	I	I	I	Ι	 	Ι		I	I	Ι	I	I	 		I	 	I	
_		_	_		-		-	-		-			_	_	-		-	-	
		T N	· · · ·	Curv m			91	4 11	C	112		ē	5			¢	c		
Ney to plant designers: Acc	J=Alleli & Garcia, A&I =A	or 1 Maill	u acturing, A	TREALAC		NI SIGEI, CLUU		loiavari bia		up, CEE		diffecting, CI		S Services,	ירובררו	, Collie	Cornelle	Engineer-	
ing, CPE=Coal Processing F	ingineers, Co =designed by	the minin	g company,	Cyc=Cyc]	one Machin	e, Dan=Danie	els, Dvo	=Dravo, El	[W=Eagle	Iron Work	s. EIM=	Eimco, Env=	Envirotech,	Erw=Erwin	Industri	es, F&I	² =Farnhar	n & Pfile,	

FMC=FMC, Far=Fairmont Machine, GMC=General Mine Contracting, H&P=Heyl & Patterson, H-S=Holmes-Shaney, Ind=Indiana Steel, IN=Industrial, IR=Industrial Resources, Int=Interstate, Jef=Jeffrey, KHD=KHD Humboldt Wedag, Jam=FF. Jameson, Kai=Kaiser, Kil=Kilborn Engineering, L-B=Link-Belt, Lin=Lincoln Contracting, LiveJy, L-A=Long-Airdox, Mc=Menally Systems, MP=Minerals Processing, NH=Norton Hambleton, Nor-Norwest, Pet=Peters Equipment, Pow=Powell Construction, PM=Process Machinery, Ram=Ramsey, Raw=Raw Resources, R&S=Roberts & Schaefer, Rol=Roller, See=Seeco, Sim=Simon Carves, Tag=Taggart (DRA Global acquired Taggart), Wil=Wilnont, Wem=Wemco. Key to header: Raw feed = capacity (tons per hour), Quality = Ib-SO2/mmBtu (<1.2, low sulfur; 1.2-2.5, medium sulfur; and >2.5, high sulfur), HM=Heavy Media; WO=Water Only, LD=Large Diameter (greater than 30 inches),

Cycl=Cyclones, Ves. = Vessel, Analyzers: ash, A; elemental, E; and moisture, M. Controls: Man = Manual, PLC = Programmable logic controller, and DCS = Distributed control system. Key to coal companies: Alliance = Alliance Coal Co., AMCI = American Metals & Coal Int'I, CONSOL = CONSOL Enegry, ACNR = American Consolidated Natural Resources.





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Pragmatic OEMs Balance Customer Needs With Low-carbon Goals

Top truck and shovel OEMs enter partnerships and develop solutions to help customers achieve their most critical goals, which align with the U.N.'s 2030 Agenda

By Jesse Morton, Technical Writer



This year, First Mode is retrofitting a Komatsu 930E, similar to the above, with a hybrid battery and hydrogen fuel cell powerplants. (Photo: Komatsu)

Calendar year 2030 is the deadline set by the United Nations (U.N.), its Net Zero Coalition, and the World Economic Forum for Global Compact participants to reduce carbon emissions attributed to their operations by at least 45%. Mining industry Compact participants, as well as society at large, has much to accomplish before then to make that happen, according to the top suppliers of truck-shovel mining solutions.

For example, a new supply chain is required, and will be created during a period when supply chains across all sectors are disrupted. Meanwhile, miners are expected to innovate, embrace rapid change, and adopt new solutions, while hamstrung by staffing shortages. These two challenges alone are substantial.

The OEMs all either directly or indirectly support the U.N. 2030 Agenda. They also say that they will not confound the trending push by the U.N. and activist investors for zero-emissions solutions with the very real and timely needs of customers.

All signs right now seem to point to a future of sustainable development, they said. But when and how the mining industry gets there will be dictated by the definitive needs of society and mining companies, not ideologues. The solutions and partnerships making headlines today reveal the pragmatism and optimism that could lead to success for both miners and society.

A Committed, but Practical Approach

On April 20, Hitachi Construction Machinery Co. (HCM) joined the U.N. Global Compact, becoming one of more than 22,000 companies and organizations partnering with the global governance body on its 2030 Agenda. By joining the Compact, the participant agrees to "engage in partnerships that advance the U.N. Global Compact's principles and support broader U.N. goals, such as the U.N. Sustainable Development Goals," according to the U.N.

Even before joining the Compact, HCM was in line with the Agenda. For example, the company signed a non-exclusive memorandum of understanding with ABB Ltd., which joined the Compact in 2000. The partnership seeks to explore opportunities for mine operators to target carbon-neutral operations. HCM told *Coal Age* that the MOU will help it bring to market solutions "that will reduce greenhouse gas emissions from heavy mining machinery."

For example, the partnership is developing "an engineless full-battery rigid dump truck" that could use a "proven trolley system, drawing its energy from overhead lines, allowing simultaneous charging of the onboard battery system while providing energy to power the truck (dynamic charging)." The partnership is also exploring multiple charging methods.

Also, recently, HCM made headlines for partnering with First Quantum Minerals on battery-powered trolley trucks for Kansanshi copper-gold mine in Zambia. The first truck will have an ABB battery and an onboard charger, and will begin feasibility trials this year.

The battery can also be charged by captured power from a retarder braking system.

Kansanshi, located near Solwezi in the North Western Province, is the ideal mine for the project. It already has in place trolley assist systems and dozens of Hitachi trucks. The project is an example of the pragmatic duality practiced by HCM regarding electrification of trucks, shovels, and truck-shovel mining solutions. The company envisions itself as committed to "developing solutions that allow society to grow in harmony with nature," said John Schellenberg, mining product manager, customer care, HCM. The company is also, at the same time, relatively conservative in its approach to that. The solutions it develops draw on 30 years of "electrifying mining products." The word new cannot always be used to describe them.

"Hitachi Construction Machinery has taken what we hope is a practical approach to developing technology in this space," Schellenberg said. "We did a lot of analysis of operations before committing to a design direction, and then focused on solutions that we could prove had economic value with currently available technology."

This is not to say HCM engineers don't have their eyes to the horizon, he said. "We know there will be many innovations in the coming years that will provide a number of new solutions, but we wanted to demonstrate that there are opportunities with today's technologies to help customers meet their financial and social obligations," he said. "This does not mean we are not following new technology development closely. We are."

HCM is just careful to participate in the hype. It starts projects and partnerships because they meet the very real demands of customers, Schellenberg said. "While there certainly is a lot of social pressure on the mining and mining equipment suppliers to transition away from hydrocarbon fuels, there is also an economic case to be made for the technology shift," he said.

"Almost all mining companies need a strong financial case to justify the transition in technology," Schellenberg said. "Regional energy costs, and the energy intensity of an application are the main factors in creating that financial case."

Electric and battery-electric truck, shovel, and truck-shovel mining solu-

tions can offer higher energy output than does the diesel competition. "Diesel engines' power output is very dependent on the size of the engine, and haul trucks are very space and weight constrained," Schellenberg said. "Electrical energy output through battery or hybrid systems can exceed the output of a conventional diesel engine."

That means future trucks could have a much higher power-to-weight ratio than do today's diesel trucks. They could give more production for their carbon footprint, which will soon be taxed. "This allows for more flexibility in mine design and operational practices," Schellenberg said.

Other efficiency gains could come by reducing energy loss. For example, "whenever a truck brakes, energy is converted to heat and dissipated," he said.

"In the case of shovels, slowing or braking of the swing circuit is again losing energy," Schellenberg said. "Newer technologies would allow us to capture the energy from these actions and use it."

HCM annually invests up to 3% of total revenue in research and development, which includes research into autonomous haulage. So far that has yielded substantial tangible results. In 2020, HCM and Rajant Corp. announced four autonomous haul trucks were operating in an Australian coal mine. The partners reported the number was to rise over the years to more than 40.

HCM said it expects "to extend our solutions delivery into other regions not in a distant future, and digger automation, starting with operator-assist functionalities, have been piloted for commercial release to support customers." Future innovations, it said, will "leverage consistency of digital skills investments balanced to flexibility in utilizing fleet assets effectively."

HCM's pragmatic approach to following the Agenda helps it hedge against the uncertainties of a world in voluntary transition from the known to the still theoretical. With the Agenda, "we are replacing or exchanging the main energy source used to power the mining vehicles," Schellenberg said. "A completely new ecosystem, from supply, transmission, storage, and vehicle management needs to be developed in a very short frame."

Conversely, the fossil fuel industry enjoyed an expansive, multigenerational timeframe to nearly monopolize the global energy supply system,



In June 2022, Liebherr delivered five T 264 trucks for Thiess to Encuentro copper mine in northern Chile. The units are designed to be retrofitted with zero-emissions technologies. (Photo: Liebherr)



The pre-series R 9300 G8 at the Tabang coal mine helps Indonesia's PPT Karunia increase production. The unit is capable of adopting future technologies that enable automation and reduced emissions. (Photo: Liebherr)

he said. The 2030 Agenda is "trying to replace that system in only a couple of decades while competing with the rest of society for resources."

Promising Technology, a Pragmatic Outlook

Komatsu said that the path to emissions-free truck-shovel mining in 2030 and beyond faces very real challenges, but that the company is eager and well positioned for the journey.

"Yes, the global supply chain, which is currently under duress, is going to need to develop to meet the upcoming needs of OEMs and customers," said Patrick Singleton, product director, electric drive trucks. "This will unquestionably cause increased pressure and likely new approaches to the supply chain."

Autonomous mining solutions will be key to answering labor shortages that could otherwise pose a potential roadblock to the needed innovation by mining companies, he said. "Automation is not a new paradigm in mining by any stretch of the imagination, but as mining becomes more autonomous, the labor crunch will wane and new and different kinds of positions within mining will be created." The "final pillar," he said, is fleet management. "The 'magic' of the truly efficient electrified operation will be the ability to sequence haulage assets to a variety of static and dynamic charging sources, as well as highlighting units that require maintenance."

These trends will culminate in the fully electrified mines and mining operations of 2030 and beyond. "It is impossible to overstate how this transformation touches on technological advancement in almost every element of mining we see today," Singleton said. "Operations will require a variety of future technology development including various charging options and other infrastructure elements, which can be blended between various OEMs, depending on the specific mine site needs."

Currently, admittedly, "the technology is very much in the early stages of development," he said.

"When technology is in these early 'can we?' development phases, the costs are typically higher," Singleton said. "As with any adoption curve, some customers want to be out in front, and the functional and marketing benefits that come with early technology adoption are also tangible." Early technology from Komatsu would include the EVX truck, a proofof-concept power-agnostic design showcased at MINExpo, where it was a "major success," he said. "We have had other encouraging design successes that indicate that we have systems under development that can help optimize equipment performance in the electrified mining environment," Singleton said. "As always, all development comes with a note of caution in that it needs to be stressed in order to understand its true capability."

Other technology development milestones include the partnership between Cummins and Komatsu to develop zero-emissions haulage equipment, announced in June 2022. The companies plan to focus on, among other things, hydrogen fuel cell solutions for trucks.

In December 2022, Frontrunner AHS, Komatsu's autonomous truck haulage solution, passed a major milestone. Approximately 5.5 billion metric tons (mt) of material, across 20 active sites, has been moved using AHS. Currently, an order for 62 new 930E trucks equipped with AHS for Los Bronces copper mine in Chile is being delivered. The mine could serve as a venue to showcase AHS, Komatsu said.

Separately, a Komatsu 930E-4 is being retrofitted with a hybrid battery and hydrogen fuel cell powerplants for trials at First Mode's new proving grounds in Washington (U.S.A.) this year. Roughly a year ago, First Mode and partners deployed a proof-of-concept hydrogen-powered haul truck at Anglo American's Mogalakwena mine in South Africa.

Komatsu's partnerships to arrive at solutions that ultimately reduce carbon emissions exemplify the efforts of Komatsu's Greenhouse Gas Alliance, Singleton said. "This is a forum for sharing ideas in a truly unprecedented way."

The Alliance launched in 2021 with the initial target of advancing Komatsu's power-agnostic truck concept to market by 2030. But the Alli-

ance goes beyond developing specific solutions for a specific task.

"Through the Alliance framework, Komatsu's GHG partners work directly with us to actively collaborate on product planning, development, testing and deployment of the next generation of zero-emission mining equipment and infrastructure," Singleton said. "We are collaborating with and utilizing the input and expertise of infrastructure providers and developers as well as our customers."

Komatsu Ltd. signed the U.N. Global Compact in 2008 and is committed to the 2030 Agenda. Singleton said that the hype around the Agenda and the rush to 2030 deadlines presents a challenge to suppliers, who will undoubtedly require "patience." Conceptually, the technology needed is within the sights of the OEMs today, he said.

"However, getting it supplied on a production scale and hardening it for the mining environment are the areas where things are going to need the appropriate amount of time to find and clear the fuses in the design," he said. "Of course, supply chains are going to have to develop that can support batteries and flexible infrastructure elements, but I believe we can, and will, overcome those hurdles."

They will be overcome, in part, because of the hype. "The investment by OEMs, suppliers, and most importantly, customers is at a level that we may never have seen in the industry," Singleton said. "And this is truly a situation where necessity is the mother of invention," he said. "With this type of desire and investment, alternative solutions are bound to come to the forefront."

Committed to the Industry

Liebherr Australia and Foretscue Metals Group are co-developing trucks with zero-emissions power system technologies. Announced in June, 2022, the effort includes Williams Advanced Engineering, and is meant to "support global initiatives to reduce emissions," Liebherr said. This year, the OEM reported the sale and delivery of truck-shovel mining solutions that feature advanced technologies, to include automation, that help miners improve efficiencies, reduce fuel usage, and cut emissions.

In February, Liebherr reported Nguvu Mining ordered a fleet of 13 Liebherr T 236 trucks for the Nzema Gold mine in Ghana's Western Region, roughly 80 km from the port of Takoraidi. Leadership at the mine said multiple factors prompted the purchase.

"Liebherr's open and transparent communications and its ongoing strong commitment towards a well-established support network, with a large stock of spare parts in Ghana, were key deciding factors for Nguvu Mining," said Nguvu Mining CEO Angela List.

The mine plans to produce 350,000 oz per year. The trucks are uniquely equipped to haul overburden and oxide ore at the mine, said Loïc Siegel, regional sales manager, Africa.

"With the T 236's high 'take-off torque' and accomplished electric drive system, mining operations will benefit from increased traction upon inclines above 12%, while having the option to switch to trolley assist and propulsion purely upon electricity," he said. "These 100-mt-class machines will prove to be a valuable partner to Nguvu Holdings as it works towards its goals."

The mine operates two Komatsu PC1250 excavators and 11 Caterpillar 777Es, which will be replaced by the Liebherr fleet.

Liebherr Ghana will provide technicians and operator training and will support the commissioning. "The mine will be well prepared at commissioning," Siegel said.

Separately, Liebherr reported mining contractor Karunia purchased four R 9300 G8 excavators for Tabang coal mine in the Kutai Kartanegara Regency of East Kalimantan, Indonesia. The purchase follows successful trials of a pre-series unit.

The miner described the unit as ideal for the application, said Bertrand Bedo, Liebherr regional sales manager, Asia. "Production, availability and fuel consumption figures measured since the startup in September 2022 are meeting or exceeding the targets," Bedo said. "Operators are saying the machine is fast, smooth and precise."

The excavator "helped Karunia achieve its ever-increasing production targets," Liebherr said. The miner said "the performance of the R 9300 G8 has been staggering and surpassed all expectations."

The excavators "will play a crucial role in increasing the efficiency of Karunia's operation," Liebherr said.

The R 9300 G8 was released at the last bauma exhibition in Germany. It is the second model in the G8 portfolio, features advanced technologies, and is capable of adopting future technologies that enable automation and reduced emissions, Bedo said.

"Liebherr Power Efficiency, available as standard on the R 9300, is a proprietary management system for the engine and hydraulic system controls, which substantially reduces fuel consumption without compromising the overall productivity of the machine," Bedo said. "Compared to previous model, the machine achieves 25% more mt moved per liter through 15% less fuel burn and 5% more productivity."

The excavators will be delivered from late 2023 to early 2024 and will join the R 9300 pre-series unit that has been on site since September 2022.

Also in February, Liebherr reported a second 800-mt-class R 9800 G6 was commissioned for PT Amman Mineral Nusa Tenggara at the Batu Hijau mine in West Nusa Tenggara, Indonesia.

At a ceremony marking the milestone, the project manager noted how the assembly took 20 days, less than half the time it normally would.

The miner's first R 9800 G6 was commissioned in April 2021. Since then, "Liebherr Indonesia has received positive feedback from the customer," the OEM said.

"According to the mining company, the first R 9800 has been an important asset in helping AMMAN meet its production targets," Lieb-



Stakeholders witnessed a live demonstration of some of the capabilities of Caterpillar's first battery electric 793 truck at the OEM's proving grounds near Tucson, Arizona. (Photo: Caterpillar)

herr said. "The arrival of the second R 9800 will boost overall production even further."

The model is the largest excavator in the portfolio, and is best paired with trucks with a capacity of more than 240 mt.

The miner is "Indonesia's secondlargest copper and gold mining and processing company," Liebherr said.

Liebherr also reported it supplied 11 T 264 trucks to Thiess in 2022. Five went to Encuentro copper mine in northern Chile in June, and six went to a mine in the U.S.A.

"These mining trucks will help to increase the productivity and efficiency of Encuentro mine with their payload of 240 mt, high speed on grade, incredibly fast cycle times, and the best power-to-payload ratio in their class," Liebherr said.

The T 264 delivers "increased operator safety with an ergonomically designed cab, maximum visibility during operation, and protection against both roll-over and falling objects," it said. "These trucks are designed so that zero-emissions technology can be retrofitted into the machines, thus future-proofing Thiess' investment in this equipment."

The trucks deployed in the U.S.A. were built to operate at high altitudes, and had heated dump bodies, bigger fuel tanks, and engine heaters. They were built at Liebherr's Newport News, Virginia, factory, and were delivered ahead of schedule.

The OEM used "all of its capabilities to deliver a reliable product" ahead of deadline, said Shane Kuhlmey, divisional director, mining, Liebherr U.S.A. "As Thiess expands in America, we will be right there with them providing high-quality solutions that deliver on our commitments to the mining industry."

A Focus on Increased Value

In Q4 2022, Caterpillar reported it completed development of and successfully demonstrated its first battery-electric 793 truck. The truck was demonstrated on a 7-km course and, while fully loaded, achieved a top speed of 60 km/h.

On a downhill leg of the run, the truck captured braking energy.

The 793 completed the run with enough battery energy to "perform additional complete cycles," Cat reported.

The truck was co-developed at an accelerated pace with Early Learner program mining partners BHP, Free-port-McMoRan, Newmont Corp., Rio Tinto, and Teck Resources Ltd. "The Early Learner program launched in 2021 and focuses on accelerating the development and validation of Caterpillar's battery electric trucks at participating customers' sites," Cat said.

Separately, at roughly the same time, Caterpillar announced a new iteration of

the 793 with "up to 6% more payload than the 793F." It "boasts the highest payload in its size class, up to 244 mt."

The new 793 offers 10% faster cycle times. "With its gross 1,976-kW rating, the engine can be ordered in U.S. EPA Tier 2 equivalent or Tier 4 Final/EU Stage 5 configurations to meet any region's emissions standards," Caterpillar said.

The truck has fully integrated electronics, and is shipped with Cat Product Link Elite with 4G/LTE connectivity or optional dual-mode cellular/ satellite or local WiFi networks. Mine-Star Command for hauling is optional.

The unit has the same cab as the 785 and 789. It has two screens that consolidate all machine data, controls and guidance information. Cat Detect object detection comes standard.

The new 793 is designed to last more than 100,000 hours, Cat said. Its "long-life frame features mild steel to provide flexibility, durability and resistance to impact loads, and the frame, powertrain, engine and components are built to be rebuilt."

Also in Q4 2022 and Q1 2023, Caterpillar reported passing two of what the company called "significant milestones."

In January, Caterpillar reported its next-generation hydraulic shovels are now helping customers achieve higher production at a lower cost compared to competitive machines. "Next Generation 6060s are improving our customers' experience as we speak," said Paul Taylor, HMS value stream manager.

The new 6060 has an array of features that help it do that. For increased safety and productivity, the "state-of-the art cab" is "quieter and more comfortable, and provides 40% greater visibility than previous cabs," Cat said. The cab allows "operators to load more and experience less fatigue over the course of a shift."

The shovel features optimized electronic architecture that is designed for future updates. It "delivers additional performance and reliability advantages, helps operators be more productive, enables a proactive approach to maintenance, and improves connectivity to optional advanced technologies," Cat said.

Automation tools that assist operators include Hydraulic Optimization, Enhanced Motion Control, and Payload.

Hydraulic Optimization "dynamically assigns individual pumps or groups of pumps to deliver the exact flow and pressure that each hydraulic function requires," Cat said. "This approach reduces waste and heat, prolongs component lives and conserves energy."

Enhanced Motion Control "helps improve operator performance while protecting the machine from damage," Cat said. "Payload provides on-the-go weighing of material to improve loading efficiency."

The shovel uses some designs, components and parts that are common to other Cat equipment, which streamlines maintenance and helps the customer weather trending supply chain disruptions. "Parts are stocked around the world for fast, efficient service," Cat said. "Service literature is easy to read and understand so technicians have the information they need to perform maintenance and repairs."

The 6060 is designed to use solutions that will give it power source options. "Recognizing that sustainability and carbon footprint are key focus areas for miners today, next-generation shovel innovation is closely tied to mining companies' energy transitions goals," Cat said. "In the future, next generation shovels will be power agnostic, with two different options for the power module: diesel or electric drive," the OEM said. "They will be almost the same machine except for the power module, which can even be swapped years down the road."

These features combine to offer a range of benefits, foremost of which is superior reliability. "The best thing we can do for customers with the next-generation shovels is to make them more reliable than the ones before," said Paul Taylor, HMS value stream manager." Meeting the critical needs of customers is what drives innovation at Caterpillar, said Matt Jacobs, HMS sales manager. "When we're developing new features or updating our current offerings, we want to make sure those improvements are always focused on increasing the value customers get from our machines," he said. "We know we've achieved that goal when our customers can increase their production and profit with our shovels," Jacobs said. "And we're proud to say that our next generation shovels are on track to do just that."

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NTEP-certified Volumetric Scanner For In-motion Load Scanning

By Jesse Morton, Technical Writer

Walz Scale–Scanner reported the WLS-M Off-Road Truck Volumetric Scanner system is NTEP certified, and is "the first and only scanner system to achieve this certification in the world." The system can help a customer increase productivity and contend with the big trending challenges of the day.

Available for use with all types of mining trucks, the system is described as "the next revolution in production monitoring for mining operations." The main hardware is a stoplight-sized over-the-road LiDAR scanner. For material density, weight and volume data, the system can integrate the supplier's portable scales. A high-definition camera system for more detailed imagery is available.

The local software can operate independently or be integrated, and can be accessed on the cloud via subscription for an easy review of the data using handheld devices.

The system offers in-motion load scanning. It requires no calibration or maintenance. Features include a built-in ticketing system, graphical load images, a real-time load volume measurement system, and cloud-based reporting.

Deliverables can include autonomous payload monitoring, 3D load placement imagery, real-time material density tracking per load, and real-time carry back monitoring and alerts.

The solution will give engineers an "extensive dataset" on which to base decisions, said Derek Schussele, technical sales, Walz Scale–Scanner. "Our solution offers a better understanding of the overall production process, including cycle times, hauled volume, hauled mass, bulk

density, unit and truck performance compared to capacity, driver performance, overload, underload, carry-back detection, truck body load distribution, and load placement."

Mine management can use the "technology to ensure that their team is meeting, or exceeding, production goals," he said. "Also, and perhaps more importantly, to have the information at hand to communicate with their team to improve their daily action items."

Foremost of the benefits offered is the capability to increase productivity. "With the seemingly ever-increasing regulatory environment, the first focus for the scale and scanner is efficiency and maximizing production," Schussele said. "The miner can see the truck haulage data in near real time and that enables them to communicate with all mining teammates with actionable communication." One customer in India was able to use the system to help increase haulage efficiency from "high 78% to over 93%," he said.

To address supply chain challenges, "we took action to expand and invest in our rental fleet," Schussele said. "Walz Scale currently possesses the largest inventory of rental portable mining scales, and volumetric scanners."

"In addition to expanding our rental fleet, we have made a considerable component inventory investment, so that when a scanner, scale or pair order is placed, we don't let world happenings dictate our business and service model," Schussele said. "This ultimately helps our clients and partners focus on the task at hand."

Walz Scale–Scanner service experts can help a shorthanded customer deploy a system and complete a study. "We can provide our greatest asset, our people," he said.

The supplier offers technicians to "work with you onsite and complete a full spectrum weight and volume payload study," Schussele said. "This includes performing the entire study plus generating the after-action report via our Payload Pro Software."

The WLS-M Off-Road Truck Volumetric Scanner requires minimal labor. "Our clients have the ability to have the scanner, which can also be paired with a scale, to run automatically," he said. "This eliminates the need for someone to operate the Walz system and frees up mine staff to perform and focus on additional means and ways to increase efficiency around the mine site."



The WLS-M Off-Road Truck Volumetric Scanner is easy to install and operate, requires no calibration or maintenance, and offers in-motion load scanning. (Photo: Walz Scale-Scanner)

Automation also offers safety benefits. "The scale and scanner systems can be run automatically with no attendant present," Schussele said. "This keeps personnel away from the trucks, further aiding a safety mindset."

The data the system gathers can be used to improve worksite safety.

"The system provides information about overload," he said. "Another unique safety aspect of the volumetric scanner is to see if there is carry-back in a truck body, prior to the truck entering the service bay."

Reducing carryback "prevents material from sloughing off the body, in the raised position, and possibly injuring a technician," Schussele said. "The scanner allows the customer to clean out the body prior to servicing the truck."

Adoption requires minimal infrastructure, which can help a miner meet regulations. "Of course the systems may be installed in a permanent location, but otherwise it allows the mine site to configure the systems with portability in mind," he said, "easily moving the measurement asset to the most efficient location and path for scanning and weighing."

The NTEP certification caps "years of development, testing, and perfecting," and launches "the next chapter in the Walz story," he said. "Adaptation and advancement has always been a hallmark of mining and we try to lead the way with weighing and volumetric scanning solutions."



The WLS-M Off-Road Truck Volumetric Scanner can be integrated into a system to deliver autonomous payload monitoring, 3D load placement imagery, real-time material density tracking per load, and real-time carry back monitoring and alerts. (Image: Walz Scale–Scanner)



Shortage Raises Concerns, Opportunities

A two-way radio shortage means miners will have to find alternatives, creating opportunities for suppliers and distributors

By Jesse Morton, Technical Writer

Calling it a seller's market for handheld two-way radios with MSHA approval for underground applications may be an understatement. Buyers will find that selection is, at best, limited and pricey. This has opened the door to alternatives, such as repairs and rebuilds, as well as other solutions for underground communications.

Demand for Repairs Grows

MineSafe Electronics said it can repair and rebuild MSHA-approved two-way radios, an offering that is seeing growing demand amid a reported shortage in new radios.

"Honestly, we've repaired more units lately than we have sold new,

but it is just because there are none being produced," said Will Alvey, purchasing manag-MineSafe er. Electronics. "I had hundreds of radios on order when they told me that there iust are none and there are not going to be any more."

Until Q2 2023. Kenwood supplied the NX-203/303, which MineSafe Electronics carried. Another distributor confirmed to Coal Age that the model is discontin-



Suppliers and distributors confirmed the NX-203/303 has been discontinued, creating a shortage of new two-way MSHA-approved handheld radios for underground applications. (Photo: Kenwood) ued and that new units are unavailable. Previously, Motorola supplied a MSHA-approved two-way handheld radio, which was also discontinued. Both models may still be found at auctions, but otherwise cannot be found new for sale anywhere, Alvey said.

Used, broken, and partial units of both models may be salvaged by MineSafe Electronics. "We repair both of those," he said.

"Send in cores. Send us your garbage and let us see if we can make a radio out of it," Alvey said. "If anyone can get their hands on an MSHA radio, working or non, we fix them here. We can make them work."

The surge in demand for repaired or rebuilt MSHA-approved two-way radios has prompted the company to change its business model. "For years we operated on a percentage," he said. "If it was going to cost us more than 50% to fix it, then we would just trash it," Alvey said. "But nowadays, people are paying more for repairs and used radios than what new ones used to cost, just to have one in their hand."

Going forward, a shortage of new MSHA-approved handheld two-way radios could eventually present a serious challenge to certain underground mining operations. "It needs to be known right now that there is an upcoming safety issue with miners not being able to buy new approved radios," Alvey said.

"It is really scary right now," he said. "For the last couple of decades, miners have been using two-way radios to communicate, and right now that is being severely messed with with no new products available."

MineSafe Electronics is renowned for its flagship wired mine phone offering, the Communicator III. "This technology has been around for



Tried and true, the Communicator III is a wired MSHA-approved mine phone that is priced to move, Minesafe Electronics said. (Photo: Minesafe Electronics)

years and years, and we're still doing the tried and true approved mine phone," he said. "Communicator III is a MSHA-approved mine phone," Alvey said. "It is a page phone so you have paging capabilities as well as just talking handset to handset."

The Communicator III is popular due, in part, to the short lead time and the low price. "Generally speaking, in two or three weeks we fulfill orders, which seems to be industry leading," he said. "And you don't want to just come out and say, 'I've got cheapest one on the market,' but we do have the least expensive unit out there, which gives us a lot of business."

The Communicator III is the result of four decades of evolution. "Our phones are made in a fiberglass case," Alvey said. "Some phones are made in stainless steel cases," he said. "That is one of the reasons that we are able to have a little bit lower priced product." The company sells as many as 500 units per year.

With its 50-year anniversary approaching, MineSafe Electronics is de-

veloping a podcast to help spread needed information on and to the mining industry. "Around the country, when you get away from the Basin here, and you get away from blue collar areas, I think there is a negative stigma to mining," Alvey said. "We want to highlight that there is a lot of good folks, great people, in this industry," he said. "We want to keep them safe."

Wireless Capabilities Grow

Matrix Team reported it is continuing to further integrate technologies into its N-Connex high-speed data network for more benefits to customers.

A modular network, N-Connex "is fully compatible with 802.3 and 802.11 Ethernet and WiFi devices for voice, tracking, atmospheric monitoring, data and video systems," Matrix Team said. "WiFi solutions include voice and data support for private calls, push-to-talk broadcasts, tablets, laptops and smartphones."

The system is described as easy to update and expand, and is capable of supporting "all" WiFi and Ethernet devices.

"We're now combining data technologies within our networking system to enable more efficiencies in the mining process," said Chris Adkins, mining manager, Matrix Team. "These tech stacks are providing state-of-the art solutions for mining," he said. "For example, we're enabling mines to connect with all of their devices that are data-enabled, such as vehicle and belt monitors."

The data is then used in analysis and planning. "Preventive maintenance data points can be obtained through the system for many measuring devices, including strain gauges and vibration monitors," Adkins said. "There are numerous benefits to this data collection, including reducing downtime by reporting abnormalities."

Among the benefits offered is more efficient inventory management and maintenance. "They will have the ability to order parts from the warehouse, look at schematics of equipment and reference maintenance manuals remotely," he said. "The system can also enable Facetime video that allows people on the surface to see issues underground."

Another benefit is improved communications that accelerate problem resolution. "Clear and precise communications, preventive maintenance, and the ability to fix any issues in a timely manner can significantly increase production and revenue in a mine," Adkins said.

The supplier has deployed "several systems recently," he said.

"These range from a mine using them as a check-in, check-out system



Burning Springs mine installed an N-Connex network with Icom VOIP radios, tracking software, environmental monitoring, and WiFi blasting capability. (Photo: Matrix Team)

all the way to numerous mines installing full tracking and communications systems with vehicle monitoring," Adkins said. "Our most successful fully implemented system is at Burning Springs mine."

The mine installed N-Connex with Icom VOIP radios. It supports tracking software, environmental monitoring using Maestro Digital Mine, tablets, and WiFi blasting. The system has reportedly helped the mine reduce downtime, and improve safety and security.

Rugged Smart Phone With PTT, SOS, Emergency Response Features

RugGear introduced the RG880 smart phone, a rugged and slim Android 13 device with a large push-to-talk (PTT) button on the side, an SOS button, and a switch for group PTT calls. Having passed multiple military standards tests, it is dropproof and water-resistant.

The RG880 supports GPS, GLONASS, Galileo, Beidou and A-GPS. It allows positions to be determined quickly and with high precision in the event of an emergency, RugGear said.

The smart phone is equipped with the PTT/MCPTT-optimized Snapdragon 680 4G Mobile Platform from Qualcomm Technologies, and supports 3GPP Release 12. It has a 5.5in. screen, an innovative speaker design, and a fingerprint sensor, the company said.

Other features include a 50-megapixel camera that can capture high-resolution images and videos. The fast-charge battery can be quickly and easily replaced, the company said.

The RG880 is compatible with global carrier standards.



Certified to IP68 and MIL-STD-810H testing standards, the RG880 is drop-proof from 1.5 m and water-resistant to 1.2 m. (Photo: RugGear)

Wireless Networks Improve Safety, Efficiency

By Paul May

The MINER Act of 2006 marked a significant turning point for wireless communications and tracking (C&T) networks for the mining industry, initiating a 20-year cycle of ongoing product and technology development. The results of these efforts, such as C&T networks that have been installed and are operational in mines, have led to documented improvements in mining safety, efficiency, and overall productivity.

The original intent of the Act was to improve emergency responses at coal mines by being able to locate and communicate with every miner underground. However, wireless equipment providers for the mining industry have continued to enhance the wireless C&T technologies and are now offering networks that include additional communication modes, asset tracking, environmental monitoring, wireless alarms and notifications, and wireless broadband backhaul to improve production methods.

Networks Initiate Change

These improvements have had a transformative effect on mining operations, allowing mines to easily install remote monitoring sensors, install wireless ventilation and energy controls, and collect data for predictive analytics. They were also the beginning of an evolutionary process for the miners that adopted them and also for the industry in general.

The MINER Act is best known for defining the improvements needed in wireless infrastructure and handheld devices to meet safety requirements for miner tracking and post-incident communications. But another provision in the Act, the establishment of National Institute for Occupational Safety and Health (NIOSH) research grants for projects related to miner safety, has had an equally significant long-term impact for the min-



Wireless mesh communications equipment can be easily deployed (and re-deployed) to meet the changing coverage requirements in a mine. (Photo: IWT)

ing community. These grants, which jumpstarted the needed technology research and product development efforts, have provided the mining industry with commercial sources for C&T networks.

Since 2006, NIOSH grants have resulted in the four major C&T product developments for the mining industry.

Wireless Mesh Networks

First was the commercialization of intrinsically safe wireless mesh networks optimized for the challenging underground mining domain. Mesh networks intercommunicate using multiple redundant paths so that signals are automatically rerouted when obstructions or disruptions occur.

Redundancy means that a properly constructed mesh network eliminates single points of failure, ensuring that wireless voice and tracking communications are reliably transmitted from one end of the network to the other.

Wireless Environmental Sensing and WGMs

Other NIOSH grants helped fund the development of battery powered monitors for atmospheric gases (carbon monoxide, carbon dioxide, and methane) and absolute air pressure, air temperature and humidity. The pressure data can be used for ventilation monitoring, and the ventilation data gathered from the wireless gas monitors (WGMs) can be used for ventilation planning.

One key requirement for these devices is the use of C&T networks for data transport and alarm notification to users both underground and in administrative dispatch hubs.

Smart Battery Technology

Also partly developed with NIOSH money was maintenance analytics capabilities to remotely monitor battery health for intrinsically safe backup batteries installed in C&T network infrastructure. Due to the specialized nature of intrinsically safe batteries, the existing commercial technology could not accurately predict the degradation of those batteries, which, in turn, lead to batteries that would "silently fail."

Today, the smart battery technology in the C&T equipment will alert mine maintenance to replace the batteries before a failure will adversely affect the overall safety provided by the network.

Mine Safety Data Analytics Engine

There is a growing market need for a data analytics engine that can collect, parse, measure, analyze, and present big data at mine sites as actionable information to mine managers. The data can come from a variety of sources, but one key origin is data collected from users and equipment on the C&T network.

The correlation of personnel location and environmental data, along with additional telemetric data from mining equipment, will allow mine operations to have a comprehensive, real-time picture of operations. The analysis and correlations from historic data can then be fed into predictive analytics to predict potential safety risks, resulting in recommendations for proactive safety measures.

Leveraging New Tech to Augment Old Tech

While NIOSH grants have been successful as a kickstarter for the development of communications technology in the mining industry, wireless communication vendors have also made significant investments on their own to expand the capabilities of the original C&T networks. One example is leveraging the deployment of high-bandwidth fiber optic and ethernet cabling used to carry wireless voice and tracking to aboveground operations centers.

New intrinsically safe wireless broadband mesh equipment, developed specifically for the mining industry, provides convenient Wi-Fi access points for a wide range of data collection and dissemination. These hotspots can also collect telemetric data from equipment passing by, or from fixed equipment in the coverage area. Because the mining hotspots use wireless mesh backhaul, the network can easily grow or move with advances in the working section.

Additional customer-driven C&T enhancements are currently being released by wireless equipment vendors. The Internet of Things (IoT) continues to generate new control, sensor, and data collection devices for mining extraction and material handling equipment.

In cases where IoT equipment generates alarms, C&T networks can route the alarms to individual or group handsets or to section alarms for mass notification. C&T networks have also expanded the interoperability capabilities for voice communications, allowing the voice transmissions to be interconnected to legacy aboveground analog and digital LMR networks, cellular push-to-talk networks, and phone systems.

Geofencing for Additional Safety

Finally, C&T real-time location services are being augmented with high-precision ultra-wide-band sensor networks for geofencing of hazardous areas and equipment. These high-precision location services can be used for stand-alone proximity detection or integrated into vehicular controls to protect miners from accidental pinning or crushing.

The high-precision location service can also be integrated with C&T communications networks to provide real-time equipment status updates using mining tracking and visualization software in the operations office.

High precision location services, combined with wireless broadband mesh, can support a variety of emerging technologies as well. For example, with these integrated technologies, mines will be able to adopt virtual-reality and augmented-reality technologies to train new miners by simulating complex procedures or emergency conditions. While today's wireless broadband mesh products can support limited video streaming, ongoing developments will increase this capability. The wireless broadband mesh technology will also provide the network access for advancements in tele-remote and autonomous longwall, continuous mining, and haulage equipment.

The net result of the improved communication networks combined with advanced data collection and back-end data analytics provides the basis for the digital transformation of the mining industry. Mines will be able to replace manual information-collection processes, estimates, and intuition with data-driven decisions to meet safety standards, production goals, and efficiency improvements.

Mines that have embraced data automation and analytics are seeing measurable improvements in productivity because exceptions, such as equipment failures, are reported and corrected on a real-time basis. Combining the real-time data with analytics on maintenance records and regulatory compliance issues drives additional efficiency gains by eliminating issues, such as equipment failures, before they occur.

The Miner Act of 2006 has had a profound impact on the mining industry's approach to communications and tracking systems. The mandated upgrades and subsequent technological advancements have resulted in safer working conditions for miners.

The integration of advanced communication networks, real-time tracking, and data-driven monitoring has transformed underground mining operations from isolated environments to interconnected and safer spaces. This digital transformation brings data-driven solutions to enhance operational efficiency, safety, and sustainability. And, as technology continues to evolve, the communications backbone provided by the C&T networks will support further innovations to enhance miner safety and operational efficiency.

Paul May is product manager for IWT.

Diamond Bits Boost Productivity for Roofbolters

By Steve Fiscor, Editor-in-Chief

Roof bolting is one of the more hazardous occupations underground. The roof bolting machine operators, or roof bolters, drill 4- to 8-ft holes in the roof underground. After they drill each hole, they insert a resin cartridge, spin the bolt through it and then hold it in place until the resin cures. In a way, it's like installing the rebar after the concrete is poured. The process allows the miners to band three or four weak layers of rock together to form a solid beam.

Working at the active face near an unsupported top has its challenges. To add a little more pressure to the situation, the continuous miner section cannot advance until the roof is supported. Any process, equipment or tool that improves safety and productivity for roof bolters is of vital interest to the underground coal mining sector.

U.S. Synthetic Mining & Construction manufactures diamond bits for roof bolting applications. Miners are reporting a great deal of success using diamond bits. When compared with carbide-tipped bits, they last longer, drill faster and have a usable life that exceeds carbide on average by 100 times or more, depending on geology. While they are more expensive than carbide, the actual cost per foot of advance is dramatically reduced. "We focus on creating a premium diamond insert material for the drilling tool," said Joe Memmott, manager for mining and construction tools for U.S. Synthetic. "Traditionally we work with the customer to create and craft a product that fits their requirements."

Bill Brady introduced the gold roof bits in the early 2000s. In 2008 Brady sold his company to U.S. Synthetic, a subsidiary of ChampionX. U.S. Synthetic is a premier manufacturer of polycrystalline diamond products, operating more than 80 diamond presses at its 200,000 ft² facility in Orem, Utah.

The Wasp and Viper bits, as an example, have been designed specifically for roofbolting applications. An available reamer attaches to the bit and



The Wasp uses diamond inserts, which improves drilling in roofbolting applications, and extends bit life. (Photo: U.S. Synthetic)

cleans the hole so the drill steel doesn't get hung up. Ideally, the roofbolters want the drill steel to drop out of the hole quickly and easily, and they do not want to fight to get it back into the hole.

The Viper is the workhorse of the product line. The Wasp was developed as a more cost conscious alternative. "Coal operators were looking for something that was a little less expensive than the Viper," Memmott said. "So, we recently introduced a variation, the Wasp. The primary difference is with the diamond, which is not the hardest diamond we make, but hard enough for coal applications, with a slight change in geometry."

The usable life of a diamond tipped bit far exceeds that of a comparable carbide bit. Some of the mines using the Wasp bit are seeing consumption rates of roughly 100:1 (carbides:diamonds), Memmott explained. "One of our coal customers recently said they were getting about 250:1," Memmott said.

Comparing prices, a 1-in. carbide bit sells for around \$3 and a 1-in. Wasp bits sell for \$166. When a roof bolter is getting a minimum of 75 to 80 holes with one bit, Memmott explains, it pays for itself in addition to all the time saved changing bits and handling them underground.

"The Wasp has high abrasion resistance," Memmott said. "The sharp edge of the diamond is maintained for a long time and drills consistently over a much longer period of time than carbide. The edges of carbide inserts wear quickly compared to diamond."

Understanding the Impact of Pressure

The U.S. Synthetic bits are hard, but they are not indestructible. "If the roofbolters hit geology like cracks or laminations, where they are drilling through a soft zone and then hit a hard layer, the transition could damage the bit, especially if the bolter operator is applying a lot of pressure to the steel and moving quickly through the soft zone.

"When the bits hit something extremely hard at high rpm and high thrust, the diamond (like carbide) can crack or chip, and that's an area that we're working on right now to create a more crack-resistant diamond," Memmott said. "We've started testing a new diamond composition with a couple of lines and we will be excited to bring that to the market soon."

Memmott said that he and his team like to meet with miners, who are using diamond bits for the first time, and help them make the adjustment. "Oftentimes, we go underground and watch as they cycle through the first few holes," Memmott said. "If we need to, we give feedback on pressures and speeds and provide recommendations. They usually have a ton of experience and can use their gut instinct to get to the right place. We learn from them as well."

The Wasp maintains its sharpness and it doesn't need to be pushed as hard. "We find that a lot of bolters are running 7,000-9,000 lb thrust and they are typically pushing the carbides as hard as they can," Memmott said. "We use a load cell to measure the force as they push up against the roof. Roofbolting machines are capable of 10,000-11,000 lb thrust and sometimes that doesn't quite register."

Memmott said he likes to tell the roofbolters to picture two fully loaded

WET OR DRY

How Do You



seven diamond bits compared to 1,623 carbide. (Bar chart: U.S. Synthetic)

Chevy Silverados sitting on the end of the drill steel. "That's the load they are placing on the steel," Memmott said. "That's not meant to be trivial, we take safety very serious."

With a diamond tool, U.S. Synthetic recommends drilling at pressures around 3,000 lb. The drill steel carries less load, and it is less likely to fail. Memmott has observed that roof bolters will attain better productivity levels at 3,000 lb and speeds around 500-600 rpm. "Since these tools are sharp, they will maintain a consistent penetration rate throughout the hole, and hole after hole," Memmott said. "The edge of the carbide inserts wears much more rapidly than diamond. At first, the penetration rate is fast and then it slows as the edges wear. Meanwhile, the roof bolters are applying full force to maintain a steadily slowing penetration rate until the bit is replaced.

"With the Brady Bits, we are encouraging the roof bolters to let the edge do the work and not the pressure, and they will find the sweet spot," Memmott said. "And even though they may not be pushing quite as hard, the operators will save time overall with bit and steel changes."

Memmott said that roofbolters that have used the Wasp love them. "They love them so much, they tend to put them in their pockets and hold onto them for later use," Memmott said. "We coach the continuous miner section coordinators and warehouse managers to ask them to show them the worn bit before they hand out a new one. It generally works quite well that way."

October 2023

U.S. Synthetic is passionate about the use of diamond for drilling, so much so that they bought a roofbolting machine to use in their lab. "We have a Fletcher bolter with large blocks of granite, sandstone and limestone and we perform tests," Memmott said. "It's not just that we 'think' this bit will work. We know it will. We test them on a bolter and it's a full tool test. It's instrumented up like crazy. We measure the thrust, torque, and penetration rates."

Carbide bits also generate more dust. "When the edge of the carbide is rounded off, it's doing less cutting and more rubbing," Memmott said. "The bit produces more fi ne powder. With the sharp edge, the Wasp produces more cuttings and less dust. The cuttings are collected by the vacuum, and you have less dust passing through the filter media." Diamond bits also generate less noise.

According to Memmott "The Wasp is premium product, but pays for itself over and over again. U.S. Synthetic provides quality materials and support. We do a number of manufacturing checks along the way to make sure that these bits are amazing."

A customer did the math recently on one of their sections. "They spent \$1,000 on seven of our bits and to drill the same distance they spent \$3,500 on carbide," Memmott said. "They provided the number of bits they used and measured the footage."

Mines will save time and money with diamond bits. When used properly, they can drill quickly and consistently with less force.



Simmons Achieves ISO 9001 Certification



The ISO 9001:2015 certification validates the quality work performed at Simmons Equipment Co.

Simmons Equipment Co. recently announced that it has been certified as ISO 9001:2015 compliant. The company said the internationally recognized certification underscores its unwavering commitment to delivering high-quality products and services to its customers while adhering to the highest standards of quality management.

ISO 9001:2015 is a globally recognized standard for quality management systems that demonstrates an organization's ability to consistently provide products and services that meet customer and regulatory requirements. Achieving this certification signifies Simmons Equipment's dedication to continuous improvement and its commitment to exceeding customer expectations.

"This achievement of ISO 9001:2015 certification is a testament to the hard work and dedication of our entire team," said Matt Simmons, president and CEO for Simmons Equipment. "We have always been committed to delivering innovative solutions to our customers, and this certification further solidifies our dedication to quality and customer satisfaction."

Simmons Equipment's ISO 9001:2015 certification is a result of as-

sessments and audits conducted by Intertek, an accredited certification body, confirming that the company's quality management systems meet the stringent requirements of the standard. These systems encompass many of Simmons Equipment's operations, from product design and development to manufacturing, sales, and customer support.

The benefits of ISO 9001:2015 certification for Simmons Equipment's customers include:

- Enhanced product quality and consistency as a result of effective processes in procedures laid out in the ISO 9001 management system: Customers can trust that Simmons Equipment's products and services are of the highest quality and adhere to international standards.
- Improved customer satisfaction: The certification ensures that the company has effective processes in place to meet customer needs and respond to their feedback.
- Increased efficiency and productivity: ISO 9001:2015 principles promote process optimization and waste reduction, leading to improved operational efficiency.

Commitment to continuous improvement: Simmons Equipment's ISO 9001:2015 certification demonstrates its commitment to continually enhancing its quality management systems and overall performance.

Simmons Equipment said it is excited to embark on this new chapter with ISO 9001:2015 certification, reaffirming its dedication to quality, customer satisfaction, and continuous improvement. As the company continues to grow and innovate, the company said customers can expect even higher levels of excellence in the industrial solutions they receive.

Trimble Launches Technology to Mitigate GNSS Signal Interruptions

Referred to as solar activity, ionospheric disturbances peak every 11 years. The next major disruption, Solar Cycle 25, is expected to peak between 2024 and 2026. Trimble recently introduced IonoGuard to mitigate ionospheric disruptions in positioning and navigation by minimizing performance impacts caused by scintillation or signal noise.

Ionospheric activity can directly impact the quality of GNSS signals, leading to the degradation of position accuracy. While this type of disturbance has the greatest impact on high precision GNSS users operating around equatorial and high latitude re-



Trimble is preparing GNSS users for a possible disruption from Solar Cycle 2025.

gions, global disruptions are possible during the height of the solar cycle.

"IonoGuard is Trimble's newest innovation on the path to raise the bar on positioning integrity and performance worldwide," said Stuart Riley, vice president of GNSS technology at Trimble. "It brings our customers closer to uninterrupted and robust positioning data on every project, around the clock. Whether it's mitigating the impacts of Solar Cycle 25 or another ionospheric event, we're building advancements into Trimble GNSS technology to deliver accurate and reliable positioning solutions today, tomorrow and beyond."

Available as a downloadable firmware update on Trimble GNSS receivers using Trimble's ProPoint GNSS positioning engine, the company said IonoGuard leverages the latest developments in its high-precision receiver hardware design and signal tracking to deliver improved positioning performance in challenging environments. This will minimize the probability of a complete loss of GNSS signals and improve the quality of the signals' accuracy and integrity.

Liebherr Deploys AHS Fleet for Validation

Liebherr Mining has announced that it has deployed a fleet of four 240-ton, T 264 haul trucks to a mine in Western Australia to support onsite validation of its Autonomous Haulage Solution (AHS). The company said it recently completed internal validation at its Mining Technology Development Center in the U.S. and the onsite validation marks a new stage inits strategy to accelerate development of a new autonomy product for the mining industry.

"After significant research, development, and program planning, Liebherr is excited to announce the commencement of onsite AHS validation as we move to deploy the next generation of autonomy technology for mining equipment," said Scott Bellamy, divisional general manager, product management, for Liebherr Mining. "This deployment not only represents Liebherr Mining's market introduction of the AHS, but also highlights Liebherr's continued expansion as a technology solution provider for the mining industry."

Liebherr said its flexible scope of solutions provide mines with scalable options, from autonomy ready haul trucks through to the fully integrated Liebherr AHS, also including a fully integrated fleet management system. The company said it supports open architecture solutions, which allow mines to choose which machines, automated systems, traffic management systems, and fleet management systems will work best for their purposes.

"Along with the first deployment of the autonomy solution, Liebherr has expanded its autonomy project team to include onsite support for the duration of the AHS validation program," Bellamy said. "However, our focus is to ensure the organization can support in the future not only this exciting project, but also future AHS deployments across multiple customers and regions."



A mine in Western Australia will test four Liebherr haul trucks operating on AHS. (Photo: Liebherr)

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- Industry-leading performance
- Partner in solving difficult challenges



Product News

Water Truck Uses Less Water

Proper haul road dust management at mine sites is paramount for the health and safety of workers. Built on a Cat truck chassis, the new 785D water truck infuses technology with the Cat water delivery system (WDS) to offer a smarter way to maintain haul roads, using less water.

The new 785D water truck solves overwatering and underwatering issues and features an integrated 32,000-gallon water tank, complete with spray system, splash guards, fill chute and rock ejectors. Combined with Cat MineStar Edge connectivity with both basic and premium plan options to fit site needs, the WDS helps operations manage watering at the site more safely and productively.

Offering a maximum water flow reaching up to 1,200 gallons per minute (gpm), the truck's AutoMode spray controls determine water coverage automatically based on the activated number of heads and truck speed. Manual mode allows the operator to set a constant waterflow rate, regardless of speed. Featuring exclusive variable active spray heads to regulate water spray and flow, the 785D delivers a waterflow rate ranging from 35 to 600 gpm per spray head. The spray system automatically controls the head opening to achieve AutoMode coverage or manual mode flow rate.

The Cat WDS is integrated into the 785D's cab. The system continually adjusts waterflow during operation to achieve the desired coverage and flowrate, reducing the risk of accidents due to poor visibility while conserving water. Featuring soft start-ups, the system's water pump starts and stops automatically when the truck slows or stops to prevent overwatering and poor traction at intersections. The pump automatically turns off when the tank empties to prevent system damage from the pump running dry.

WDS system components include the water cannon, oil cooler, variable displacement pump, hydraulic oil tank, electronic control boxes and hydraulic motor/water pump. Water cannon operation is integrated into the cab's joystick controls and can be discharged while idling to conserve fuel. It features a maximum flow rate of 1,250 gpm at high idle and sprays at a maximum distance reaching 200 ft. Complete with auto shut-off to prevent overfilling, remote tank fill control enables the operator to remain inside the cab during refilling to reduce accidental slips and falls.

Scalable to meet specific site needs, MineStar Edge integrates with

the WDS to collect and communicate truck data, so the fleet can be monitored to meet production targets. Collected in real-time, the data includes truck location and utilization, fuel and water levels, volume of distributed water, coverage area, and waterflow rate, among other metrics.

The 785D water truck is fully supported by Cat's extensive dealer network. Including tank and components, the integrated water truck is covered by the Cat factory standard warranty and is eligible for Cat equipment protection plans and customer value agreements. Retrofit kits are available for existing Cat 785D truck platforms in the field. *www.cat.com/watersolutions-au*

Smart Pump Adapts to Conditions

Xylem unveiled the Flygt Bibo Alpha dewatering pump to the U.S. market. The pump could revolutionize drainage and pioneer the next generation of smart pumps, the company said.

With advanced automated control technology, the solution offers numerous benefits. The 10-hp pump automatically adapts to its environment and only operates when needed, delivering energy savings of up to 60% over traditional dewatering pumps,



Xylem said. Operational wear and tear is reduced by up to 70% as instances of snoring and dry running are minimized, leading to as much as a 50% reduction in repair and maintenance costs. Bibo Alpha has with 30% fewer components, reducing the amount of inventory needed.

With plug-and-play capability, the need for configuration is minimal.

Flygt Bibo Alpha has a life-span that is up to four times longer than traditional dewatering pumps, Xylem said.

In testing at the Renström mine in Sweden, Flygt Bibo Alpha delivered product and repair savings of 40%, the supplier said. New Boliden reduced the cost of its dewatering processes by almost 30%.

Flygt Bibo Alpha is available for purchase in the U.S. *Xylem.com*

Slurry Analyzer, Thermal Probe

Arenal introduced the slurry mass flow analyzer and thermal probe. Both offer an impressive operational lifespan, the company said.

The units have a durable design and use advanced algorithms for accuracy and repeatability, Arenal said. Features include chemical and wear resistance; full compensation for density; accuracy; and a measurement range starting at 2.5 cm/second. Magnetized and ra-



dioactive slurries do not influence measurements, Arenal said. The solutions can handle "all (mixed) chemicals and slurries in any concentration." *Arenal-pcs.com*

Al Software for Automatically Revising Code

Emerson reported its REVAMP software for transitioning legacy technology to DeltaV automation architecture uses cloud computing and artificial intelligence (AI) to automate up to 70% of system configuration, reduce errors and manual code conversion work, and slash capital costs by up to 15%.





 I Certify that All Information on This Form is True and Complete. I Understand that Anyone Furnishing False of Misleading Information or Who Omits Material or Data Requested May be Subject to Criminal and/or Civil Sanctions: Steve Fiscor, Publisher, 9/25/2023 The software combines an extensive knowledge base with a library to develop continuously updating AI models. Each modernized control system feeds back into the REVAMP software, creating learning algorithms that get smarter and faster at converting legacy code, Emerson said. The modernization project is automatically fully documented, and significant portions can be generated in the DeltaV control system, enabling the latest capabilities, and using modern standards.

Emerson.com

Asset Management System Offers Safety

South Africa's Booyco reported the Booyco Electronics Asset Management System (BEAMS) software is revolutionizing the way mines process and evaluate captured data. BEAMS acts as a single source of information, a comprehensive hub that consolidates data from both Booyco safety hardware and monitoring devices into a robust database, the company said.

The web-based software suite also transforms a vast amount of data into a single, comprehensible and manageable stream. This offers greater insight into various facets of the mining operation and can contribute to increased safety and productivity levels, Booyco said.

For example, BEAMS can analyze data to detect patterns that could indicate unsafe behavior. BEAMS can feed a digital twin model with real-time, accurate information about the state of the mine's assets and the environment. The model can support proactive measures, risk analysis, and better decision making, Booyco said.

Web-based, BEAMS is engineered for easy implementation and adaptability, and offers seamless integration into existing systems and workflows. The software suite can be configured to meet the unique needs of each user, offering a standard set of reports or providing customized reporting to address specific requirements. *Booyco-Electronics.co.za*



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ADVERTISING INDEX

Cambria Co. Assn. for the Blind and Handicapped (CAB)	9
Caterpillar	BC
Coal Age Website	19
Conn-Weld Industries LLC	IBC
Eriez	27
Haulage & Loading 2025	13
Innovative Wireless Technologies (IWT)	IFC
Jennmar Corp	3
Matrix	33
Mining Media Int'l - Subscription Renewals	37
U.S. Coal Show Longwall Edition 2025	25
US Synthetic Mining (Brady Bit)	35
WireCo WorldGroup	11

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MININGMEDIA INTERNATIONAL

Previously Unregulated Coal Ash Facilities May Become Regulated

By Brent A. Rosser and Linda Trees



On May 18, the U.S. Environmental Protection Agency (EPA) proposed a rule that would expand the federal regulations governing the management of coal combustion residuals (CCR) to cover landfills and surface impoundments that were previously excluded from regulation under the CCR Rule, first promulgated in 2015 under the Resource Conservation and Recovery Act (RCRA). The CCR Rule sets national minimum standards for the management of CCRs at existing and new landfills and surface impoundments, but it currently does not impose requirements on impoundments at inactive facilities.

EPA's proposed rule expands coverage of the CCR Rule to inactive facilities by establishing two new classes of regulated CCR units: legacy CCR surface impoundments and CCR management units (CCRMUs). A legacy impoundment is defined as a CCR surface impoundment that no longer receives CCR but contained both CCR and liquids on or after Oct. 19, 2015, and that is located at an inactive electric utility." A CCRMU is defined as "any area of land on which any non-containerized accumulation of CCR is received, placed, or otherwise managed at any time," including "inactive CCR landfills and CCR units that closed prior to Oct. 17, 2015."

Although EPA recognizes that this is a broad definition, it suggests at the same time that the definition is narrower than the plain language implies: "The Agency does not intend that the placement of *any amount* of CCR would *necessarily* constitute a CCRMU, and that CCRMUs would not include units which "are not designed to hold an accumulation of CCR, and in fact, *do not generally contain a significant amount of CCR*," such as "closed or inactive process water ponds, cooling water ponds, wastewater treatment ponds, storm water holding ponds or aeration ponds."

The proposed definition of CCRMU does not contain a threshold for the amount of CCR that would trigger regulation. EPA explains that a CCRMU would include CCR material that was "routinely and systematically placed on the ground, or where facility activities otherwise resulted in measurable accumulations of CCR on the ground," but there are no objective criteria for evaluating the terms "routinely," "systematically" or "measurable accumulations."

EPA provides examples of CCRMUs to include "structural fill sites, CCR placed below currently regulated CCR units, evaporation ponds, or secondary or tertiary finishing ponds that have not been properly cleaned up, and haul roads made of CCR if the use does not meet the definition of beneficial use." But EPA does not define what "properly cleaned up" means for purposes of the regulation and states only that the rule is meant to address the direct placement of CCR on the land "in sufficient quantities to raise concern about releases of hazardous constituents," where there are "no measures in place to effectively limit the contact between the CCR and liquids, and subsequent generation and release of any leachate."

Under the proposal, most of the existing CCR Rule requirements would apply to legacy impoundments, while the CCRMUs would be subject to the requirements for groundwater monitoring, corrective action, and closure. For both types of units, however, the new requirements would have accelerated deadlines for compliance as compared to the deadlines established for new and existing facilities in the 2015 CCR Rule. Given the broad definitions of these new classifications, electric utilities may have previously unregulated CCR facilities that would now be subject to the proposed new requirements and these accelerated deadlines.

Under the proposed rule, facilities would only have six months after the final rule is published to identify CCR units that are subject to the rule as legacy impoundments or CCRMUs. Moreover, the proposed deadline for completing the initial potential hazard classification, structural stability and safety assessment for legacy surface impoundments is three months after the date the final rule becomes effective, or nine months after the final rule is published. By contrast, under the 2015 CCR Rule, facilities had 18 months after the rule became effective (24 months after it was published) to complete these assessments. CCRMUs would have only six months after the effective date of the final rule to install groundwater monitoring systems and develop a groundwater sampling and analysis plan, compared to 24 months allowed under the 2015 CCR Rule.

Some companies may find these deadlines challenging for a number of reasons, including the time needed to understand the new regulations and their implications, labor and contractor shortages, delays at laboratories, supply chain issues and time needed to complete the various assessments and installation of groundwater monitoring systems.

EPA anticipates issuing a final rule in April 2024 with an effective date six months after publication. Based on comments submitted in EPA's proposal, legal challenges in the DC Circuit Court of Appeals seem likely.

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