

MINING FOCUS

Issue 1 2021

UMA

THE OFFICAL PUBLICATION OF
THE UTAH MINING ASSOCIATION

MINING FOR A
MODERN LIFE STYLE



Utah Mining

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Mining Jobs

Mine Workers.....	10,214
Support Activities.....	913
Transportation.....	4,784
Total Direct Jobs.....	15,911
Indirect and Induced Jobs.....	27,606
Total Direct and Indirect Jobs.....	43,517

Mining Contribution to GDP (millions of dollars)

Direct Contribution.....	2,744
Indirect and Induced.....	2,155
Total Contribution to GDP.....	4,899

Mining Labor Income (millions of dollars)

Direct Contribution to Labor Income.....	1,128
Indirect and Induced.....	1,284
Total Contribution to Labor Income.....	2,412

Coal Production (million short tons)..... 14

Electricity Generation from Coal (% share) ... 73

Coal Mining Jobs

Mine Workers.....	2,737
Support Activities.....	245
Transportation.....	1,161
Total Direct Jobs.....	4,143
Indirect and Induced Jobs.....	9,608
Total Direct and Indirect Jobs.....	13,751

Coal Mining Contribution to GDP

(millions of dollars)

Direct Contribution.....	546
Indirect and Induced.....	639
Total Contribution to GDP.....	1,186

Coal Mining Labor Income (millions of dollars)

Direct Contribution to Labor Income.....	340
Indirect and Induced.....	453
Total Contribution to Labor Income.....	793

Metal Mining Jobs

Mine Workers.....	3,005
Support Activities.....	269
Transportation.....	347
Total Direct Jobs.....	3,621
Indirect and Induced Jobs.....	6,747
Total Direct and Indirect Jobs.....	10,369

Metal Mining Contribution to GDP

(millions of dollars)

Direct Contribution.....	1,251
Indirect and Induced.....	610
Total Contribution to GDP.....	1,862

Metal Mining Labor Income (millions of dollars)

Direct Contribution to Labor Income.....	307
Indirect and Induced.....	321
Total Contribution to Labor Income.....	628

Non-metallic Mining Jobs

Mine Workers.....	4,472
Support Activities.....	398
Transportation.....	3,276
Total Direct Jobs.....	8,146
Indirect and Induced Jobs.....	11,250
Total Direct and Indirect Jobs.....	19,397

Non-metallic Contribution to GDP

(millions of dollars)

Direct Contribution.....	946
Indirect and Induced.....	906
Total Contribution to GDP.....	1,852

Non-metallic Labor Income

(millions of dollars)

Direct Contribution to Labor Income.....	482
Indirect and Induced.....	510
Total Contribution to Labor Income.....	991

SUMMARY

Mining for a Modern Life style



Antimicrobial Copper

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04. UTAH MINING ASSOCIATION BOARD OF DIRECTORS

Short bios on: *Matt Tobey, Rio Tinto Kennecott, Chairman, Jonathan Campbell, Wheeler Machinery Company, Vice Chairman, Marc Maglione, Wolverine Fuels, 1st Vice Chairman, Denise Dragoo, Snell & Wilmer, 2nd Vice Chairman, Brian Somers, Utah Mining Association, President*

06. PRESIDENT'S MESSAGE: BRIAN SOMERS

"Unprecedented" is a word that got a real workout in 2020, but the Covid pandemic truly created unprecedented challenges to public health, the world economy, and, of course, the mining industry.

08. UTAH MINING

The estimated combined value of Utah's extractive resource production in 2019 totaled \$6.5 billion, including production of metals and industrial minerals (\$3.5 billion), natural gas (\$760 million), crude oil (\$1.8 billion), and coal (\$480 million)



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10. MEMBER FOCUS: ENERGY FUELS

"Energy Fuels, and particularly our White Mesa Mill, is one of the best untold clean energy stories in the U.S. today. The U.S. uranium reserve can help revive domestic uranium production while also accelerating other important initiatives that play a part in making the world a cleaner and healthier place. Our White Mesa Mill in Utah is a clean energy and critical minerals hub, a concept that goes much farther than simply mining and producing uranium." Mark S. Chalmers, President, and CEO of Energy Fuels

14. RARE EARTH MINERALS

In 2020, the U.S. learned to value many things no one ever expected to lose: full shelves in the grocery store, going to sporting and cultural events, travel and social events. Zoom became a necessity for work, worship and catching up with friends.

17. MINERALS: AMERICA'S STRENGTH

Minerals provide the raw materials required for nearly every industry and consumer product, feeding our manufacturing, defense, medical and energy supply chains. They inspire the innovation of new technologies, and are vital to our national security. They propel our economy and enable America to compete globally.



Rare Earth Minerals

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18. MEMBER FOCUS: RIO TINTO COPPER

Our very first mine was a copper mine on the banks of the Rio Tinto river in Andalusia, Spain – bought in 1873 by a British-European investor group led by Scottish entrepreneur Hugh Matheson.

20. ANTIMICROBIAL COPPER

Utah is known for its copper mining. But fewer people know about copper's potential role as an effective antimicrobial against health threats.

24. PROTECTING INNOVATION THROUGH PATENTS


During World War I, Lieutenant Ernest Tribe of the British Royal Engineers noticed that conventional pipe joints tended to fail at critical times, putting his soldiers in danger. To solve these problems, he devised the grooved pipe coupling.

26. AT LAST, A VACCINE! WHAT DOES IT MEAN FOR EMPLOYERS?

With the FDA's issuance of an Emergency Use Authorization (EUA) for multiple COVID-19 vaccines, and vaccines becoming more widely available, many U.S. employers, eager to safely transition employees back to work or transition workplaces back to normal, are considering implementing vaccine recommendations or mandates in the workplace.



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Protecting Innovation Through Patents

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Utah Mining Association Board of Directors



Matt Tobey, Rio Tinto Kennecott, *Chairman*

Matt Tobey is the General Manager of Minerals for Rio Tinto Kennecott, working with his team to safely bring together one of the world's largest mining and processing operations. His clear passion for the mining industry comes from the strong relationships he's built with the people he has worked alongside for more than 20 years. Originally from St. Louis, Missouri, he began his mining career with a Bachelor's and Master's degree in Mining Engineering from the University of Missouri – Rolla.



Jonathan Campbell, Wheeler Machinery Company, *Vice Chairman*

Jonathan Campbell is the Executive Vice President of Wheeler Machinery Co. Since beginning at the company 9 years ago, he has served as Vice President and General Manager of Sales and Rental, as well as Credit Manager and Crushing Quarry Supplies Manager. Jonathan is a University of Utah alumni, where he earned a Bachelor's in Finance, as well as a Master of Business Administration. He's a passionate supporter of Utah's resource and construction industries, and he's committed to fostering a strong Utah economy. A husband and father of two sons, Jonathan enjoys spending time with his family, skiing, running and world travel.



Mark Maglione, Wolverine Fuels, *1st Vice Chairman*

Mr. Maglione currently serves as the Chief Financial Officer of Wolverine Fuels, LLC, a Coal Mining Company Headquartered in Utah, operating both longwall and continuous mining assets and employing over 1,000 people directly and approximately 4,000 indirectly. Mr. Maglione brings international operating, leadership, and business turn-around experience across diverse mining operations and projects, including Iron Ore, Minerals Sands and Coal with Rio Tinto. Mr. Maglione has also spent time in precious metals as well as oil & gas with smaller public and listed public companies in the US and abroad. Mr. Maglione holds a Bachelor's Degree from the University of Western Australia and a Master of Finance from the Financial Services Institute of Australasia, as well as professional qualifications from the Institute of Chartered Accountants Australia and the Governance Institute of Australia.



Denise Dragoo, Snell & Wilmer, *2nd Vice Chairman*

Denise Dragoo's practice focuses on natural resources, coal law, water law, environmental law, mining law, public land law, issues affecting the oil and gas industry, mine safety and health law. In addition to her service as an officer of the Utah Mining Association, Denise is a member of the State Bar of Utah and American Bar Association, a Fellow of the American Bar Foundation, serves on the board of the Rocky Mountain Coal Mining Institute, and is a trustee of the Rocky Mountain Mineral Law Foundation. She is admitted to the Supreme Court of Utah, United States District Court, United States Court of Appeals, Federal Circuit, and United States Court of Appeals, Tenth Circuit.



Brian Somers, Utah Mining Association, *President*

Brian Somers joined the Utah Mining Association and became its president in 2019. He has more than 20 years of experience in executive leadership, legislative affairs, and strategic communications. Before becoming the president of UMA, he was the managing director of the Utah Science Technology and Research Initiative (USTAR). He was also the deputy director of the Utah Department of Heritage & Arts, was on Governor Gary R. Herbert's communications staff, and had strategic communications roles in the private sector. ✨

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Brian Somers, Utah Mining Association, President

President's Message

“Unprecedented” is a word that got a real workout in 2020, but the COVID pandemic truly created unprecedented challenges to public health, the world economy, and, of course, the mining industry. Since the beginning of the pandemic, the Utah Mining Association (UMA) has worked tirelessly to provide input and guidance to various government COVID response committees, advocate for critical infrastructure industry designations and exemptions, advocate for royalty and other financial relief, ensure public health, safety, and testing protocols were consistent and appropriate for heavy industry operations, and much, much more.

The Utah Legislature was called into six special sessions in 2020 to respond to the pandemic, and UMA represented the industry at each one. UMA was also able to get two industry-specific COVID-19 relief bills passed during the special sessions of the Legislature:

- A “regulatory certainty” bill that paused nearly all new rulemakings and fee increases from the Division of Oil, Gas, and Mining, the Division of Air Quality, and the Division of Water Quality until July 2021 in order to allow mine operators to focus on the recovery of their businesses
- A bill which created a \$5 million Oil, Gas, and Mining Grant Program to provide direct assistance to small operators and service companies in the extractive industries to offset Covid-related financial losses

UMA also adapted its education and outreach programs in response to the pandemic. UMA hosted Mining Ambassador presentations via Zoom, recorded videos on mining and mineral education topics that teachers and students could access via UMA’s YouTube channel, and adjusted curricula, worksheets, and activity packets to be more easily downloadable and printable remotely.

Advocating for sound public policies which support continued investment in Utah’s mining industry is one of the primary responsibilities of the Utah Mining Association (UMA). During the recently completed 2021 general session of the Utah Legislature, UMA provided full-time representation for the mining industry, tracking and responding to every bill that might have had any potential impact on our member companies.

This year’s session was a bit more challenging given COVID restrictions which limited in-person interactions at the State Capitol. However, during the 45-day legislative session, legislators still passed

a \$23.45 billion state budget, introduced and debated 774 bills, and ultimately passed 502 of them.

I ended the session with 164 bills on my personal bill tracker, and 97 bills on UMA’s official member bill tracker. The UMA Legislative Committee took public positions on 41 of those bills. All 12 of the bills with a “high-profile support” position from UMA passed and have been signed into law. UMA worked vigorously to defeat bills with a “high-profile oppose” position, and seven of the eight of those bills were defeated. For bills with a “low-profile support position,” 14 passed and four did not, and all three of the bills with a “low-profile oppose” position were defeated.

So, despite the obstacles COVID presented to normal lobbying activities, UMA still had an exceptionally productive session.

UMA also continues to increase its visibility amongst legislators and other stakeholders. This session, I was able to give formal presentations on current issues relevant to the mining industry to the House Majority Caucus, Rural Caucus, Yellowcake Caucus, and various associations of local governments and chambers of commerce.

Here are some of the important bills UMA supported during the session:

Senate Concurrent Resolution 008 – Concurrent Resolution Supporting Utah’s Natural Resources and Energy Industries – Sen. David Hinkins, sponsor

SCR008 recites the innumerable benefits which accrue to the state as a result of its highly developed natural resources and energy industries. It also puts the Legislature and Governor on record calling on the federal government to follow its obligations under the Mineral Leasing Act and Federal Land Policy and Management Act, to consult with the state on federal actions which could impact the state, and asserting Utah’s rights to economic and energy self-determination.

Senate Bill 133 – Severance Tax Revenue Amendments – Sen. David Hinkins, sponsor

SB133 will set aside a small percentage of the severance taxes that oil, gas, and mining companies pay into new restricted accounts that will be used to fund regulatory and other support activities for the oil, gas, and mining industries by the Division of Oil, Gas, and Mining, the Utah



UMA also continues to increase its visibility amongst legislators and other stakeholders.

Geological Survey, the Division of Air Quality, and the Division of Water Quality.

These divisions have been receiving pressure to increase fees in order to have industry “pay for itself” with regards to the cost of providing regulatory and support activities, not recognizing that industry does pay for itself through direct severance taxes to the state with tens of millions of dollars in remainder. SB133 will correct this misperception and tie division budgets directly to industry revenues, which also provides a useful market signal.

House Bill 356 – Rural Economic Development Tax Increment Financing – Rep. Carl Albrecht, sponsor

HB356 makes the state’s post-performance economic development tax credits for new capital investment and incremental job creation available to mining operations for the first time. It also makes other changes which will greatly expand eligibility in rural Utah.

House Bill 388 – State Energy Policy Amendments – Rep. Carl Albrecht, sponsor

HB388 updates the state’s energy policy to include the promotion of advanced energy technologies like hydrogen and pumped storage. It also requires the state to ensure that adequate supplies of dispatchable energy are always available to meet grid demand, which will protect both fuel suppliers and industrial power users.

UMA also advocated for a number of energy bills which were problematic for the industry to be tabled or defeated (HB145, HCR5, HB123, HB263, HB89), and worked extensively to ensure that new incentives for

hydrogen production in HB223 applied to all feedstocks (including coal and natural gas.)

HB346, HB368, HB348 – State Agency Bills


UMA supported a number of bills which make changes to state agencies in which interact with the mining industry. HB346 and HB368 place the Office of Energy Development (OED) and the Public Lands Policy Coordinating Office (PLPCO) under the Department of Natural Resources, while maintaining their direct advisory roles to the Governor. HB348 makes changes to the Governor’s Office of Economic Development (GOED). UMA advocated to insert language which will require the new state economic development commission the bill creates to consult with industry associations.

Appropriations — Interstate Commerce Litigation & Economic Impact Study

UMA worked with appropriators to secure \$2 million for the Attorney General’s Office to file litigation regarding California’s interference with interstate commerce related to its carbon tax on power generated from fossil fuels.

UMA also worked to secure \$100,000 for the Department of Natural Resources to contract with an outside analyst/economist to conduct a comprehensive study on the economic impact of Utah’s natural resources and energy industries.

Although we know mining and other natural resources and energy industries are major contributors to the state’s economy, we do not have accurate data regarding GDP contributions, number of direct/indirect jobs, tax revenue estimates, etc. This economic impact study will provide that data to inform policy makers and other stakeholders.



As we’ve seen from recent actions taken by other state governments and the federal government which have had an adverse effect on the mining industry, we must always be vigilant to ensure Utah remains a great place to produce and invest.

As you know, Utah’s operating environment can change dramatically with even a single piece of unfavorable legislation. You have no doubt witnessed many of the actions taken by surrounding states in the last few years — and by a new federal administration in the last few months — that have made the climate for mining more hostile. That is why UMA vows to work tirelessly on your behalf to ensure a business climate in which you can succeed and maintain your social license to operate.

The strong support of UMA’s member companies enables us to aggressively and effectively promote, protect, and advance the interests of Utah’s mining industry, which is key in support of the lifestyles we all enjoy. This issue of our magazine highlights some of the products that make an impact on our day-to-day lives which are a direct result of our local mining industry.

We are proud of our members and the important work you do. We look forward to working with you to advance the industry, recover from the disruptions of 2020, build on the successes of the 2021 legislative session, and help you prosper in the coming year. ✨

Sincerely,
Brian Somers, UMA President



Utah Mining

Metals, Industrial Minerals, Coal,
Uranium, and Unconventional Fuels

By Stephanie E. Mills, Andrew Rupke, Michael D. Vanden Berg, and Taylor Boden



CIRCULAR 130
UTAH GEOLOGICAL SURVEY
a division of
UTAH DEPARTMENT OF NATURAL RESOURCES
2020

2019 UTAH MINING INDUSTRY SUMMARY

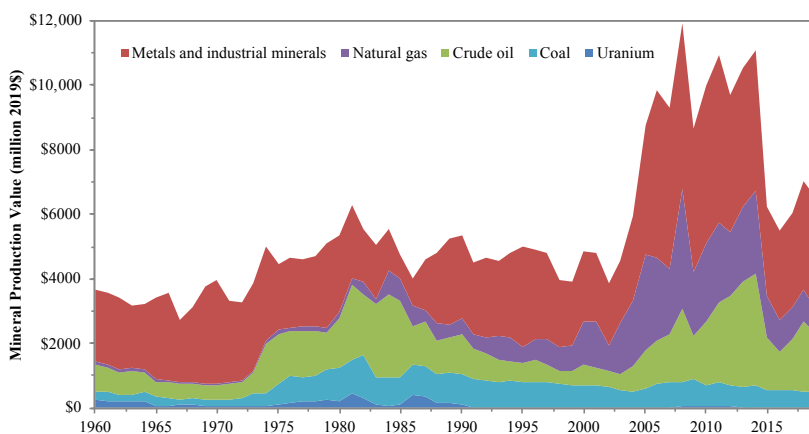
The estimated combined value of Utah's extractive resource production in 2019 totaled \$6.5 billion, including production of metals and industrial minerals (\$3.5 billion), natural gas (\$760 million), crude oil (\$1.8 billion), and coal (\$480 million) (figure 1). Utah's diverse mining industry accounted for \$3.9 billion (61%) of total extractive resource production, an increase of \$92 million (2.4%) from 2018, but 26% lower than peak values reached in 2011 (\$5.3 billion, nominal dollars). Mining activities in Utah currently produce base metals, precious metals, industrial minerals, and coal (figure 2). Base metal production contributed \$1.8 billion and includes copper, magnesium, beryllium, and molybdenum. Notably, copper accounts for 67% (\$1.2 billion) of Utah's base metal production value (figure 3). Precious metals produced in Utah include gold and silver, and 2019 production was valued at \$375 million (figure 3). Precious metal production value increased by about 29% from 2018 to 2019, but base metal values decreased about 3%. Utah also produced several industrial mineral commodities including sand and gravel, crushed stone, salt, potash, cement, lime, phosphate, gilsonite, clay, gypsum, and others (figure 2). The estimated value of industrial mineral production in 2019 was \$1.3 billion, a 6% increase over the revised 2018 estimate (figure 3). The most valuable industrial mineral group in 2019, estimated at \$483 million, was the brine and evaporite derived commodities of potash, salt, and magnesium chloride. In contrast to other minable commodities, the value of Utah coal production again decreased in 2019 to \$480 million, down from \$499 million in 2018 (figure 3). Notably, Utah remains the only state to produce magnesium metal, beryllium concentrate, potassium sulfate, and gilsonite; of these mineral commodities, magnesium, beryllium, and potash (includes potassium sulfate) are included in the U.S. Department of the Interior's 2018 list of critical minerals (Fortier and others, 2018).

Historically, Utah has been a significant producer of iron, uranium, and vanadium, but production of these commodities has been suspended due to low prices or exhausted reserves. Energy Fuels Resources operates the White Mesa uranium vanadium mill in San Juan County, which has continued to produce uranium from alternative feeds (material not sourced from Energy Fuels' mines) since the suspension of mining in 2012. In 2019, the mill for the first time since 2008 did not produce any uranium, as it transitioned to producing vanadium from pond tailings. Uranium production at the mill from alternate feeds is set to restart in 2020. *

To see the full article scan here



ugspub.nr.utah.gov/publications/circular/c-130.pdf



Source: Utah Geological Survey; U.S Geological Survey; Utah Division of Oil, Gas and Mining; U.S. Energy Information Administration; Utah Tax Commission

Figure 1. Annual value of Utah energy and mineral production, inflation adjusted to 2019 dollars, 1960–2019.

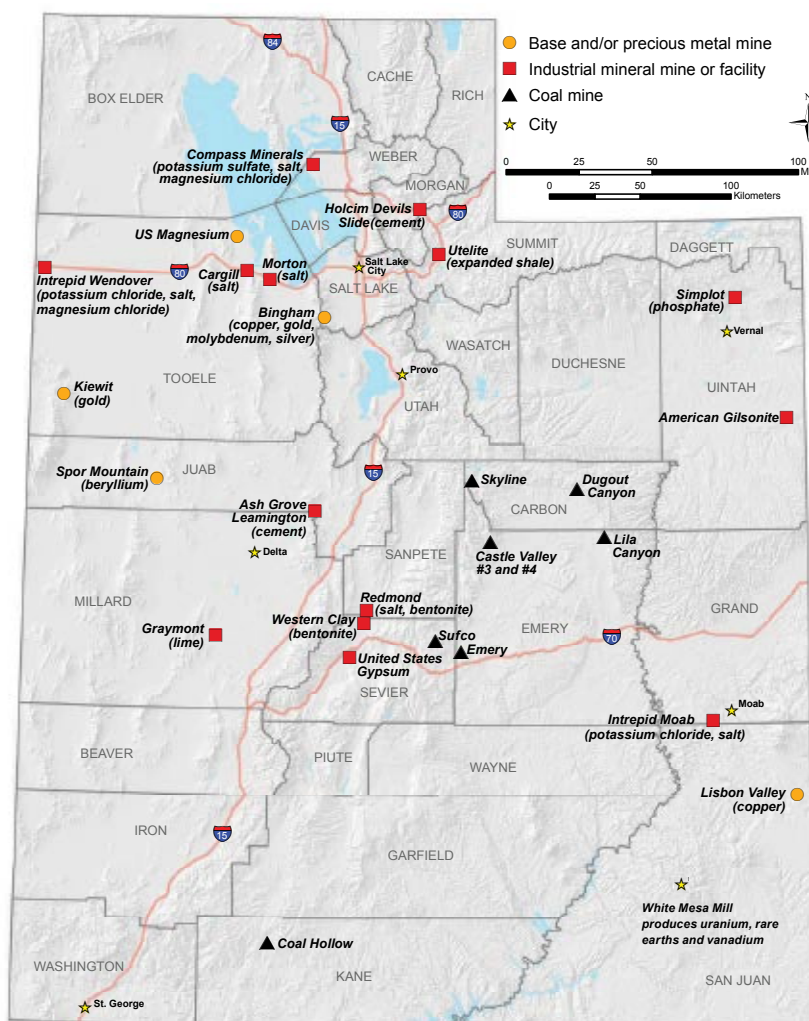
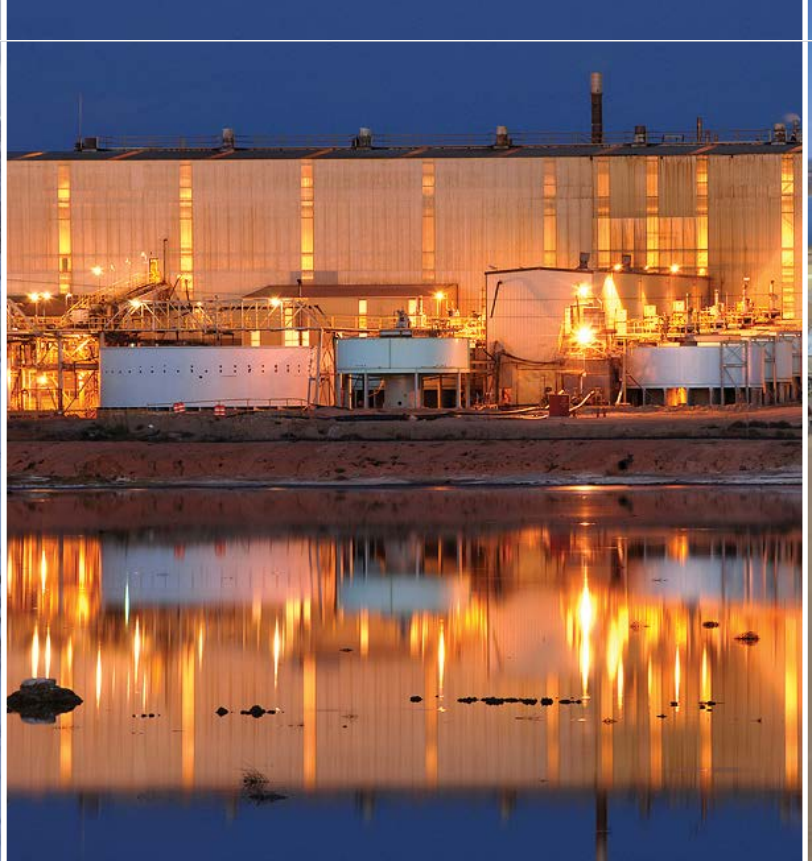


Figure 2. Select base and precious metal, industrial mineral, and coal production locations in Utah.



Energy Fuels

“Energy Fuels, and particularly our White Mesa Mill, is one of the best untold clean energy stories in the U.S. today. The U.S. uranium reserve can help revive domestic uranium production while also accelerating other important initiatives that play a part in making the world a cleaner and healthier place. Our White Mesa Mill in Utah is a clean energy and critical minerals hub, a concept that goes much farther than simply mining and producing uranium.”
Mark S. Chalmers, President and CEO of Energy Fuels

Tell us a little about the company.
We are based in Denver, and we have operations across the western United States. Our flagship operation is the White Mesa Mill in San Juan County, Utah, a few miles south of Blanding. The White Mesa Mill is the focus for our company, as we are in the process

of turning it into America’s clean energy and critical mineral hub through our uranium, rare earths, vanadium and recycling activities. Let me explain.

The White Mesa Mill is the only conventional uranium mill in the U.S. today and one of the

largest U.S. producers of this critical mineral for many years. Uranium, of course, is the fuel for nuclear energy, which provides 20% of all U.S. electricity — and 55% of all carbon-free electricity — generated in the U.S. The mill also has the ability to produce vanadium, and it was the largest U.S. producer of



this critical mineral in 2019. Vanadium is used in steel, aerospace, chemicals, and emerging grid-scale battery technologies.

But here's the really exciting part; in the last year, we've discovered a significant new opportunity at the mill, perhaps the biggest opportunity in the history of the White Mesa Mill and perhaps even San Juan County, Utah. Our core business is, of course, uranium. But it turns out that one of the highest-value rare earth minerals in the world, monazite, also contains significant quantities of uranium. The uranium must be removed from monazite ore before it can be further processed for rare earths. This is where we fit in. We have a long history of responsibly handling and recovering uranium from a variety of feeds. So, we are in the perfect position to process monazite ore for the recovery of rare earths and uranium from monazite. In fact, we have been told that we might be the "missing link" in bringing rare earth production back to the U.S.

We are already processing monazite ore at the mill on a pilot scale and producing an on-spec intermediate rare earth product. We expect to reach commercial levels of production equal to close to 10% of U.S. rare earth demand in

2021. In fact, we are more advanced than any other company in the U.S. in bringing the rare earth supply chain back to the U.S. And it's happening here in southeast Utah.

Has your business focus shifted completely to rare earth mineral processing?

Not at this point. Our focus is uranium, and we also produce vanadium and do uranium and vanadium recycling. But because of our expertise and experience with uranium, we are better suited than any other U.S. company to be on the front lines of bringing rare earth processing back to the United States.

Monazite ore is currently being mined in Georgia at heavy mineral sand operations owned by The Chemours Company, which was spun off from DuPont in 2015. Monazite is also mined in Australia, South America and Africa. These miners typically sell their monazite to China, which recognizes the extremely high value of this mineral. Chinese companies process it and make rare earth products that they export to the United States — and the rest of the world — as manufactured products like electric vehicles, wind turbines, electric motors, cell phones, computers, flat-panel displays, advanced

optics, and the like. Their ability to process rare earth minerals like monazite is part of the reason that China controls 80%-90% of the world's supply of rare earths.

Energy Fuels will never supplant China in rare earths, nor do we aspire to. However, we believe we can create a low-cost U.S. supplier of rare earths, with production that is much more environmentally and socially responsible than China.

What are rare earth minerals?

Rare earth minerals are a series of 17 elements on the periodic table that are used in a variety of clean energy and advanced technologies. Rare earth minerals can be found in cell phones, electric vehicles, electric motors, flat panel displays, medical equipment and military applications, from missile guidance to advance optics. For instance, an F-35 fighter jet uses nearly 1,000 pounds of rare earth minerals in its construction. However, we produce no intermediate or end use rare earth products in the U.S. now, which is a major concern, in particular for the U.S. military.

Will the operation in Blanding only process monazite for rare earths?

We expect to mainly process monazite. It's one of the most coveted rare earth bearing minerals in the world, with excellent distributions of the highest-value individual rare earth elements, like neodymium and praseodymium used in permanent magnets, and "heavy" rare earths used in various specialty applications. We are mainly focused on processing monazite because it contains uranium at concentrations similar to the typical western U.S. mine and very high concentrations of recoverable rare earths.

There are five steps involved in processing monazite to produce rare earths. First, the monazite ore needs to be mined. The next step is to recover the uranium and other radionuclides and produce a clean rare earth concentrate — this is where we come in. Next comes rare earth separation, where you produce individual rare earth oxides. Then, you go to metal-making and alloying, and finally magnet and other end-use manufacturing.

We have a distinct advantage over other U.S. producers because we're utilizing existing production and facilities for the first steps. This means we can save many years of licensing and construction, and hundreds of millions of dollars of capital, versus other domestic rare earth proposals trying to get

★ *Continued on page 12*



Incidentally, monazite also contains some thorium. We've already been contacted by folks in the pharmaceutical industry interested in thorium for advanced cancer treatments. It's very early days, but this is yet another potential social benefit of our rare earth production.



★ *Continued from page 11*

off the ground. Step 1 is already happening in Georgia and elsewhere. We are about to start step 2 at the White Mesa Mill. Steps 3-5 need to be constructed, but we think we can also install those capabilities at the White Mesa Mill very economically and quickly in the coming years.

We think we can be lower cost than any other non-Chinese sources of rare earths, and possibly cost-competitive with China, because we will be producing rare earths from high-value monazite at existing facilities.

How far into processing monazite are you?

So far, we have processed four metric tonnes of Chemours monazite at the White Mesa Mill — and we're very pleased with the results. We are scheduled to start commercial production of a mixed rare earth carbonate later this quarter.

At that time, we will have restored step 2 back to the U.S. However, the U.S. doesn't yet have steps 3, 4 and 5. So, for the next couple of years, we expect to sell our intermediate rare earth product to separation facilities elsewhere in the world, likely Europe. However, as mentioned above, we are working on incorporating those next steps into the White Mesa Mill.

Before you came on the scene, where was U.S. monazite going?

In the past, Chemours put their monazite on a train from Georgia to a port on the West

Coast, put it on a ship, and sold it to China. Now, we're buying it and processing it, making sure this valuable rare earth resource stays in the U.S. As mentioned above, our product will likely leave the U.S. while separation and other downstream processing is developed in the U.S. over the next couple of years. But this will just be a bridge for us. We want to keep these rare earths mainly in the U.S., including for high-tech manufacturers in Utah.

We are initially purchasing a minimum of 2,500 tons of monazite ore per year from Chemours. This ore contains roughly 55% total rare earths and 0.20% uranium. Amazingly, close to ten percent of U.S. rare earth demand is contained in this small quantity of monazite. A little bit truly goes a long way, and because over 50% of the ore contains recoverable product, very little waste is generated compared to traditional uranium mining. Incidentally, monazite also contains some thorium. We've already been contacted by folks in the pharmaceutical industry interested in thorium for advanced cancer treatments. It's very early days, but this is yet another potential social benefit of our rare earth production.

Restoring domestic rare earth capabilities is a bipartisan goal. It is unacceptable to both Democrats and Republicans that we are so dependent on China for rare earths. The White Mesa Mill can produce rare earths in a safer, cleaner, and more environmentally sound manner than anyone else in the world. Any company concerned about environmental and social responsibility needs to

be concerned about their supply chains. We think we will solve this issue in rare earths.

What are your future plans for White Mesa Mill?

Well, we're ramping up commercial production of rare earths and uranium from monazite in the next few months. And, in the next two to three years, we plan on implementing a fully integrated rare earth supply chain, including separation and other downstream rare earth manufacturing.

We'll be adding 12-15 good jobs this year at the White Mesa Mill. If we are successful with our future plans, we think we can create more than 100 clean tech jobs in San Juan County, Utah. This will be an array of good-paying jobs with benefits, from technical positions to those requiring advanced degrees.

As I mentioned above, we are turning southeast Utah into America's clean energy and critical mineral hub. We already produce uranium, which is used for the production of emission-free electricity. We also produce vanadium, which has applications in construction, aerospace and grid-scale batteries to store renewable energy. We are helping to clean up the legacy of Cold War era, government-sponsored uranium mining. We recycle uranium and vanadium, which reduces the need for mining and helps address climate change. And now, we are close to bringing rare earth production back to the U.S.

Energy Fuels and our White Mesa Mill in Utah might be the most exciting clean energy story in the U.S. today.★



Huge teams.
Hidden costs.
Everything on the meter.

Sorry, that's just not us.

Our clients hire us to understand who they are and what they want. Whether that's leaner teams, transparent budgets or alternative fee arrangements.

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**Bringing Earth's
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Rare Earth Minerals

In 2020, the U.S. learned to value many things no one ever expected to lose: full shelves in the grocery store, going to sporting and cultural events, travel and social events. Zoom became a necessity for work, worship and catching up with friends. In short, the high-tech products that made social distancing bearable and kept the restaurant industry afloat through online orders were something we took for granted in the same way we used to not-think about toilet paper. You know you don't want to live without it, but you don't think you'll ever have to.

High-tech products use rare earth elements. The most important application is probably their use in magnets for the coming onslaught of hybrid and electric vehicles. The magnets in these vehicles use neodymium (Nd), praseodymium (Pr), dysprosium (Dy) and terbium (Tb). Other applications include products as diverse as the phone in your pocket, the hard drive in your computer or laptop, medical products, military defense systems and air pollution control. They are even used to make steel alloys. Rare earth metals are needed to make more than 200 products work, even if they only use small quantities. A battery may not look very impressive, but take it out, and how useful is the thing it is supposed to power?

Certain rare earth alloys are extremely hard. They are essential for armored vehicles and projectiles that have been designed to shatter when they hit something.

Imagine navigating the pandemic without rare earth materials. If the pandemic was a nightmare, how much worse would life have been without all the miracle products most people use every day but could not make on their own? You might be able to use innovative methods to grow food, and you could probably figure out how to sew or knit something to wear, especially if you have a stash of yarn. But what if you had to walk instead of drive and could not access Netflix or any other internet staple?

What if you had no national or international news, no way to contact people except face-to-face, and the only way to mow your lawn was with a push mower? Even glass depends on rare earth minerals for polishing, color and optical properties; digital camera lenses in cellphone cameras, for example, may consist of 50% lanthanum. No lanthanum might eventually mean no more selfies — which would be hard on many people who love taking pictures of themselves to share with friends and family.

Rare earth elements are essential in our high-tech society, whether we think about them or not. What exactly are they?

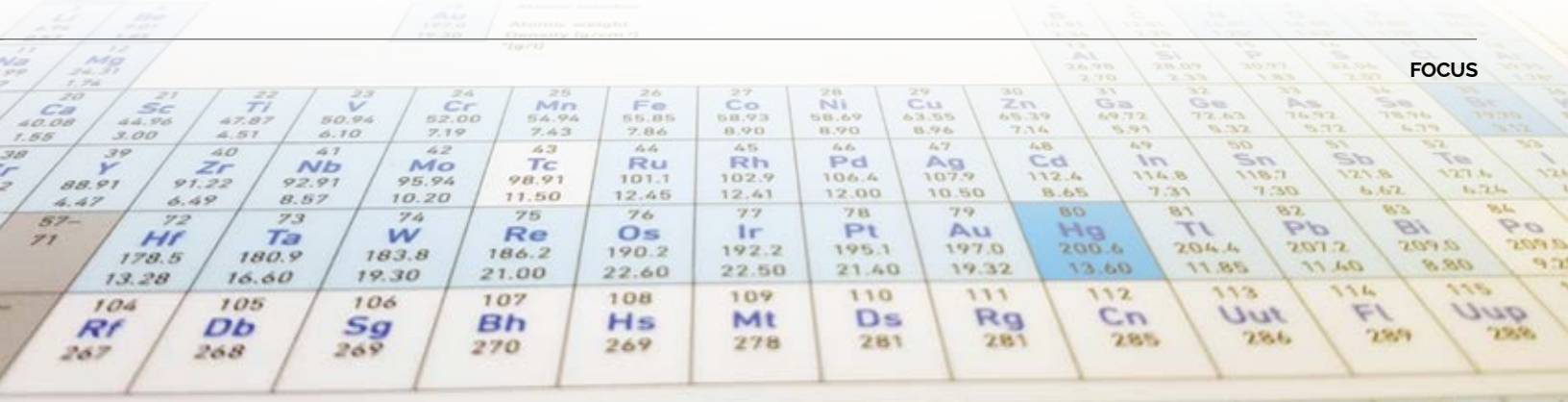
- Rare earth elements are metals.
- Their colors range from silver to gray.
- These elements are soft, ductile, malleable and usually reactive. "Malleable" means you can press or hammer them, and they won't break; "ductile" means you can make metal wire or thread from them.
- They can become more reactive under some circumstances, such as when you heat them or divide them finely.

A Swedish army lieutenant, Carl Axel Arrhenius, is credited with discovering the first rare earth mineral in 1787. It was black, and he found it in a small-town quarry near Stockholm. (The town was named Ytterby, which is how yttrium got its name in the periodic table.) Isolating the first rare earth element, however, didn't happen until 1803.

Initially, experts thought rare earths were scarce, which is why they have the name they have. However, that turned out to be a mistake. In general, they are relatively abundant. Cerium is the 25th most common element; thulium and lutetium are the least common.

There are 17 of them: scandium, yttrium and 15 lanthanides. In atomic order, the rare earth elements are listed below:

NAME	ATOMIC NUMBER	COMMENTS
SCANDIUM (SC)	21	PRODUCES LIGHT THAT RESEMBLES SUNLIGHT AND IS USEFUL IN ALUMINUM ALLOYS
YTTRIUM (Y)	39	USED IN LEDS, PHOSPHORS (ESPECIALLY RED ONES), LASERS AND SUPERCONDUCTORS
LANTHANUM (LA)	57	USED IN BATTERIES, CATALYSTS, GLASS
CERIUM (CE)	58	USED IN CATALYTIC CONVERTERS, LEDS
PRASEODYMIUM (PR)	59	USED IN PERMANENT MAGNETS; CERIUM OXIDE POLISHES GLASS AND IS USED IN CATALYTIC CONVERTERS
NEODYMIUM (ND)	60	USED IN PERMANENT MAGNETS USED FOR MICROPHONES, LOUDSPEAKERS, IN-EAR HEADPHONE, ELECTRIC MOTORS, COMPUTER HARD DISKS AND WIND TURBINE ELECTRIC GENERATORS
PROMETHIUM (PM)	61	PROMETHIUM-147 CAN BE USED IN LUMINOUS PAINT AND ATOMIC BATTERIES AND CAN ALSO MEASURE THICKNESS
SAMARIUM (SM)	62	USED IN HIGH-TEMPERATURE PERMANENT MAGNETS
EUROPEUM (EU)	63	CAN BE PHOSPHORESCENT AND IS RELATIVELY NONTOXIC
GADOLINIUM (GD)	64	USED INTRAVENOUSLY IN MRI CONTRAST AGENTS
TERBIUM (TB)	65	PART OF PERMANENT MAGNETS USED IN ACTUATORS, NAVAL SONAR SYSTEMS AND SENSORS
DYSPROSIUM (DY)	66	PART OF PERMANENT MAGNETS USED FOR DATA STORAGE
HOLMIUM (HO)	67	USED IN POLEPIECES IN THE STRONGEST STATIC MAGNETS
ERBIUM (ER)	68	HAS LASER SURGERY AND DENTAL LASER APPLICATIONS
THULIUM (TM)	69	PROVIDES RADIATION IN X-RAY DEVICES AND SOME SOLID-STATE LASERS
YTTERBIUM (YB)	70	USED IN LASER MEDIA AND STAINLESS STEEL
LUTETIUM (LU)	71	USED IN METAL ALLOYS AND AS A CATALYST FOR SOME CHEMICAL REACTIONS



Scandium, yttrium, and lanthanide are in Group IIIB on the periodic table. What that means is they have three electrons in their outer shell that form +3 ions in solution. The lanthanide series, listed below the rest of the periodic table in two rows, form the same ions and can be chemically separated in similar ways. The elements in the first row of the lanthanide series are the ones that are considered to be rare earth elements.

The term “rare earths” refers to oxides that have rare earth elements in them. (An oxide is a binary chemical compound that occurs when oxygen atoms combine with other elements. For example, water and carbon dioxide are both oxides.) Oxides can be acidic, basic, amphoteric (that is, it has both acid and base reactions), and neutral (not acidic or basic).

Lanthanides are interesting because they have photophysical properties such as long-lived luminescence. You can make highly luminescent complexes from them.

Separating rare earth elements from other elements is tricky. Ordinary chemical methods don't work because their chemical properties are too similar. Between 1787 and 1947, some scientists spent their entire career trying to get a 99% pure rare earth; the most common method was through fractional crystallization that focused on differences in solubility. In 1947, two different scientists and their colleagues came up with successful new methods that depend on ion exchanges: Gerald Boyd at Oak Ridge National Laboratory and Frank Harold Spedding at the Ames Laboratory in Iowa.

The USGS Mineral Commodity Summary in 2017 listed the following usage categories for rare earth elements:

CATEGORY	PERCENTAGE
CATALYSTS	55
CERAMICS OR GLASS	15
METALLURGY OR ALLOYS	10
GLASS POLISHING	5
OTHER	15

The need for rare earths first surfaced in the 1960s when people began buying color televisions. However, demand for rare earth elements has increased dramatically since 2000 because of their applications in cellphones and computers. Rechargeable batteries often use them, too. Electric and hybrid vehicles use substantially more rare earth elements than cellphones and computers. Even though the market is fairly saturated with cellphones and computers, the shift from gas-powered engines to electric and hybrid ones will unleash an even greater demand in the future, especially for neodymium and praseodymium.

Which countries produce rare earths? China is the current leader. That is because China created a monopoly. In the late 1980s and

early 1990s, China first got into the market and sold rare earths at such low prices that U.S. mines couldn't compete and had to close. It controlled 95% of production in 2010. China then cut back its exports and raised its rare earth prices — more than 500% in some cases. Also, China often threatens to cut off rare-earth exports to the U.S. and U.S. allies. The U.S., Australia, Russia, Thailand, Malaysia and other places sensibly decided to get back into mining rare earths when faced with these new circumstances.

Diversification is as important in mining as it is in the stock market, PPE and grocery essentials. If one source goes away, you can still rely on others to meet your needs.

Domestic production of rare earths matters because (as the U.S. has learned during the last year) long supply chains are also brittle supply chains. There's just no substitute for being able to produce goods within national borders.

Mining rare earths responsibly within the U.S. matters. You may not have realized how much of a role it plays in maintaining your day-to-day life, but without it, 2020 would have been exponentially worse. ✨

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Portland, Oregon

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MINERALS: AMERICA'S STRENGTH

Minerals provide the raw materials required for nearly every industry and consumer product, feeding our manufacturing, defense, medical and energy supply chains. They inspire the innovation of new technologies, and are vital to our national security. They propel our economy and enable America to compete globally.

Mineral Facts

Minerals – The technologies that define innovation today all depend on a growing number of minerals. The World Bank estimates that mineral demands could grow 500 to 1,000 percent by the year 2050 to meet the demands from wind, solar and geothermal power, and energy storage technologies.

- **Jobs** – 1.4 million American jobs are supported by minerals mining. 498,000 people are directly employed, and 881,000 are indirectly employed.

- **Wages** – A job in U.S. metals mineral mining is one of the highest paying in the private sector with an average salary of over \$95,000 a year (68 percent higher than the combined average for all industrial jobs) and often climbing well above \$100,000 for experienced workers.
- **Value** – \$710 billion worth of processed mineral materials were used by sectors including construction, manufacturing and agriculture to add nearly \$3.0 trillion to the U.S. economy.

Despite the benefits provided by domestic minerals mining, the U.S. is not performing to its minerals potential. American manufacturers currently rely on foreign suppliers for more than half the minerals they use. Our ability to put our minerals to work is hindered by a costly and inefficient regulatory structure that thwarts investment and expansion.

Consider:

- The percentage of worldwide exploration spending commanded by the U.S. for metals mining has dropped from 20 percent of total investments in 1993 to only 11 percent today.
- The U.S. is 100 percent dependent on imports for 17 different minerals and more than 50 percent import dependent for an additional 29 mineral commodities.

These trends are unsustainable in a highly competitive world economy where the growing demand for minerals and the need for supply stability is a growing concern. We need to address the length, complexity and uncertainty of the permitting process that is driving investment from U.S. shores. A duplicative permitting process that takes five to ten years to navigate puts the U.S. last among top mining countries when ranked on mining permitting delays. ✨



“As Congress begins to address the President's plan, any infrastructure push aimed at bringing stability and growth to our economy and strengthening our supply chains would be well-served to ensure those efforts are supplied with American-mined materials. From highways to bridges, water systems to broadband, electricity grids and charging networks – America's infrastructure projects begin with mining. Despite being home to some of the world's richest mineral reserves and abundant supplies of steelmaking metallurgical coal, we continue to source the raw materials required for America's infrastructure and manufacturing from other countries. If policymakers want to create high-paying jobs and support economic security while reshoring the nation's industrial base, made-in-America infrastructure should begin with American mining.”

— Rich Nolan, NMA president and CEO





Rio Tinto Copper

Our very first mine was a copper mine on the banks of the Rio Tinto river in Andalusia, Spain – bought in 1873 by a British-European investor group led by Scottish entrepreneur Hugh Matheson.

Today, our copper operations around the world are at various stages in the mining lifecycle, from exploration to rehabilitation. At each of our copper operations, we use leading-edge technologies that drive safe, efficient, and productive methods of extracting, processing, and refining copper, supplying customers in China, Japan, and the U.S.

Oyu Tolgoi, in the South Gobi region of Mongolia, is one of the largest known copper and gold deposits in the world. When the underground mine is complete, it will be the world's largest copper mine.

Our Kennecott mine is a world-class, integrated copper mining operation located just outside Salt Lake City, Utah, in the United States. Our Kennecott mine produces gold and silver as by-products of our copper mining. In 2019, after 75 years of operation, Kennecott retired its coal-fired power plant in Magna, Utah. Power for the operation will come from renewable energy certificates purchased from Rocky Mountain Power – primarily from wind and solar resources.

Closing the plant and acquiring renewable energy certificates will remove more than one million tons of carbon dioxide every year from Kennecott's Wasatch Front operations, reducing its annual carbon footprint by as much as 65%. The renewable energy certificate program is Green energy certified and meets the environmental and consumer-protection standards set by the Center for Resource Solutions.

In 2020, Kennecott and Oyu Tolgoi became the first producers to be awarded the Copper Mark, the copper industry's new independent responsible production program. To achieve the Copper Mark – developed according to the United Nations Sustainable Development Goals – Kennecott's and Oyu Tolgoi's copper was assessed against 32 criteria covering Environment, Community, Business and Human Rights, Labour and Working Conditions and Governance.

In the U.S., the Resolution Copper Project reached a significant milestone in 2019 with the release of a Draft Environmental Impact Statement (DEIS), which will allow us to continue progressing one of the world's most significant copper deposits towards development.

And in 2020, we announced the maiden Resource at Winu, a copper and gold project in Western Australia with the potential to become a large-scale operation over time.



Rio Tinto

Did you know?

Kennecott's copper:

- Includes recycled scrap metal, helping reduce waste: In 2018 alone, we recycled more than 2.8 million pounds of copper scrap metal – enough to provide the electrical wiring in 6,400 new homes.
- Is powered by renewable energy: By retiring its coal-fired power plant in 2019 and purchasing renewable energy certificates instead, Kennecott reduced its annual carbon footprint by around 65%. And in 2019, Kennecott was awarded Clean Air Business Partner of the Year from the Utah Clean Air Partnership for its collaboration in solving air quality challenges.
- Like all the materials we produce, our copper is essential for the future. Copper is the best non-precious conductor of heat and electricity on the planet. Because it can help things work more efficiently, copper will play an important part in the transition to a low-carbon economy. For example, a single 1MW wind turbine uses three tons of copper. And electric vehicles have a copper intensity 3-4 times higher than traditional vehicles.
- Kennecott and Oyu Tolgoi's copper has been assessed against 32 criteria – based on the United Nations Sustainable Development Goals – across the environment, social, and governance categories. These include health and safety, emissions, human rights, and community development.
- We think copper is cool for so many reasons: it is tough but malleable, 100% recyclable, corrosion-resistant, and its antimicrobial properties can even help keep us safe.
- In 2020, our Kennecott copper mine in Utah, US, and Oyu Tolgoi, in Mongolia, became the world's first producers to be awarded the

“ Our Kennecott mine is a world-class, integrated copper mining operation located just outside Salt Lake City, Utah, in the United States.

Copper Mark – the industry's independent assurance program – verifying the copper is responsibly produced.

- 6.2M pounds Copper Scrap Recycled Each Month at Kennecott in 2020.
- Copper also promises to play an essential role in the transition to the low-carbon economy. Just one 1MW wind turbine, for example, uses three tonnes of copper. And electric vehicles have a copper intensity 3-4 times higher than traditional vehicles. As a result, global demand for copper is set to grow 1.5%-2.5% per year, driven by electrification and increasing requirements for renewable energy. ✨



Antimicrobial Copper



Utah is known for its copper mining. But fewer people know about copper's potential role as an effective antimicrobial against health threats that include the following:

- Cholera
- Coronaviruses that include COVID-19
- MRSA
- Norovirus
- Virulent strains of E-coli

Anciently, some people did understand that copper could help fight disease. The Smith Papyrus, written sometime 2600-2200 B.C., contains a description of copper's first medical use. The document says copper was used at that time to sterilize water and wounds. According to other records, Babylonian and Egyptian soldiers would take shavings from their bronze swords and use them to reduce infections. (Bronze contains copper and tin.)

It took a long time for science to catch up. Thanks to Victor Burq (1822-1884), scientists and medical professionals have known copper had antimicrobial properties against cholera for more than 168 years. Victor Burq worked as a physician in France, and during his time there, he visited a copper smelting facility in April 1852. He figured out there had to be a connection between copper and its effectiveness against cholera after discovering that no one who worked at that or other nearby copper smelters died of cholera during cholera epidemics in 1832, 1849 and 1852; the few

who did get sick had mild cases. Living conditions in the smelter were poor, and those who lived there had high mortality rates from other causes. The only explanation for immunity to cholera had to be related to copper.

Burq did a survey that eventually involved 300,000 people in Europe and compiled statistical data tables drawn from the responses. Those tables are currently in the Académie de Médecine's library in Paris. They made it clear that copper was as effective against cholera as quinine sulfate was against recurring malarial fevers. Additional research during the cholera epidemics of 1854 and 1855 allowed him to discover that jewelers, goldsmiths, boilermakers and people who played brass instruments also stayed well. During an 1865 epidemic, 3.7 people per every 1,000 died of cholera. For people who worked with copper, the fatality rate was 0.5 per 1,000.

By 1867, after additional research on 400 different Paris businesses and factories, and after collecting reports on more than 200,000 people in England, Sweden and Russia, he determined that copper could be used to prevent cholera.

Some architects took note. For example, New York City's Grand Central Station has a grand staircase with antimicrobial copper handrails.

How does copper kill microbes?

- Karrera Djoko, a biochemist and microbiologist at England's Durham University, says copper releases ions that can

puncture and access germs to affect its genetic material.

- Michael Johnson, a microbiologist at the University of Arizona, says copper replaces other metal ions within a cell or virus; since metal ions are in about 40% of proteins with known structures, the copper metal ions can inhibit or destroy those proteins. Even though 40% is not 100%, it's enough to shut the proteins down.
- Michael Schmidt is a professor. He teaches microbiology and immunology at the Medical University of South Carolina; he says copper interacts with oxygen to create free radicals that explode viruses (including their DNA and RNA) on contact. Once destroyed, they can no longer mutate to resist copper or pass genes on to other microbes, which means copper will continue to be effective. That matters when so many antibiotic-resistant bacteria have become common.
- Researchers have learned that immune cells called macrophages envelop and separate germs in an acidic chamber. The macrophages then spike the chamber with copper doses.

In short, touching copper is the equivalent of sanitizing your hands. It doesn't replace avoiding the virus by wearing masks, washing hands or social distancing — especially since the virus seems to be transmitted most by

★ *Continued on page 22*



People may prefer the look of polished copper to tarnished copper, but is polishing important if copper prevents infection and saves lives regardless?

★ *Continued from page 21*

airborne particles, not contact with infected surfaces — but it is another defensive tool.

Manufacturers have seen the sales opportunity of adding copper to products such as socks or masks. There are two concerns to be aware of, according to Djoko:

- The amount of copper in a product matters. If a mask is 1% copper and 99% of something else, like fabric, it does not have enough copper to make a difference against the coronavirus.
- Many household cleaners can strip off copper ions when a copper-laced mask is being frequently washed or disinfected.

Wearing a mask, in general, is more important than whether that mask contains copper. But using an adequate amount of copper in masks, combined with increasing the number of copper touchpoints, especially in high-traffic public places such as hospitals, could make a difference as everyone continues the fight against the pandemic and other hard-to-kill diseases.

Since copper's microbial properties have been understood for so long, why isn't copper already commonly used to make products such as beds, doorknobs and railings? Michael Schmidt attributes it to arrogance and a preference for cheaper materials like aluminum, plastic and stainless steel.

That may finally come to an end, especially since many harmful microbes can live on hard surfaces for up to five days. In 2015, for example, when medical researchers were studying human coronavirus 229E, they found it could infect lung cells five days after being on surfaces such as the following:

- Ceramic
- Glass
- Silicone rubber

- Stainless steel
- Teflon

That wasn't true of copper surfaces, which quickly deactivated the coronavirus.

When people touch an infected surface, it's easy for the microbes to infect people through their eyes, mouth or nose. According to Michael Schmidt, combining standard hygiene protocols with copper touchpoints reduces the bacteria in medical hospitals and offices by 90%. According to a study in 1983, something as simple as replacing a stainless steel hospital doorknob with a copper one can eradicate *E. coli* growth.

There are 1.7 million healthcare-associated infections (HAI) that result in 99,000 deaths annually. The annual cost of treatment (successful or not) is between \$35.7 and \$45 billion. For the current pandemic, a study in a Montana virology lab by the National Institutes of Health showed that spraying the COVID-19 virus onto common materials such as plastic and stainless steel could still potentially spread the disease for three days. When sprayed on copper, however, SARS-CoV2 was gone after four hours. Copper was more effective than any other material tested at killing the virus.

Bill Keevil, a professor at the University of Southampton in England who teaches environmental health care, is a fan of copper and has received funding from the Copper Development Association. He would like to see copper used in hospitals, public transportation systems, gyms and everyday objects such as pens. Doing so, he thinks, could reduce transmission of respiratory diseases.

A three-hospital clinical trial in 2012 that was performed by Schmidt and other colleagues in New York City and Charleston found that patients were endangered by microbe

contamination of the items that were closest to them: arms of the visitor chair, bed rails, the call button, the I.V. pole and the tray tables. Copper on just those items reduced microbe presence by 83% and HAIs by 58%, even though the copper was on less than 10% of the room's surface area.

Are there other ways to kill the bacteria and viruses that can cause HAIs? Yes: ultraviolet light and hydrogen peroxide gas both work. But they are harder to use. Copper is passive; actively decontaminating a room is not. Also, a room can easily become recontaminated. Copper continues to work regardless.

Additional benefits are clear:

- There is plenty of copper. It isn't going to run out soon.
- Almost all copper can be recycled, and it is still effective afterward.
- It does not wear out or lose its ability to kill microbes.

Copper is not the only antimicrobial metal; silver is another one. But silver is ineffective when it is dry. Copper can be dry or wet. It even continues to work when it is tarnished. People may prefer the look of polished copper to tarnished copper, but is polishing important if copper prevents infection and saves lives regardless?

Is copper too expensive? According to a 338-day study done by Keevil and Schmidt in 2015, copper prevented 14 infections and saved \$397,600 in treatment costs for HAI. (To determine this number, they figured out how expensive each HAI was per patient, minus the price to install copper on 10% of the surfaces, and compared the results to the equivalent medical expenses when copper was not used.)

Imagine how much copper could have helped the U.S. in March 2020. Imagine how much of a difference it could still make now. ★





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PATENT

Protecting Innovation Through Patents

By Thomas L. Lingard, Ray Quinney & Nebeker

During World War I, Lieutenant Ernest Tribe of the British Royal Engineers noticed that conventional pipe joints tended to fail at critical times, putting his soldiers in danger. To solve these problems, he devised the grooved pipe coupling. When he returned home in 1919, he filed, in the United States, Great Britain, Canada, and other countries, a patent for a “Pipe Joint,” or an early version of the Victaulic coupling, which is the foundation upon which Victaulic was founded. Over the last 100 years, Victaulic has continued to innovate. Indeed, the United States Patent and Trademark Office has issued over 300 patents to Victaulic and its successor companies. Today, many industries around the world use both Victaulic’s initial and new coupling designs, including underground mines, surface mines, shaft sinking operations, heavy civil construction, fire suppressant systems, skyscrapers, schools, and many others.

Based at least in part on its patent strategy, Victaulic is a recognized leader in the pipe connection industry. Understanding patents is critical to understanding the success of innovative companies like Victaulic. Business owners, especially in technologically-intensive fields, should understand what can be patented and what should be patented.

What can be patented?

A patent provides the owner with the legal right to exclude others from selling the invention in the nation filed. Poor patent coverage can result in a competitor encroaching on the intended market of the patent. However, before filing a patent, an inventor should know what inventions qualify for patent protection.

The United States Patent Act states that a patent may be granted for “any new and useful process, machine, manufacture, or composition of matter.” 35 U.S.C. § 101. This description includes any tangible

product, methods to make a product or perform a function, some computer algorithms, and other inventions. A patent application is examined and enforced based on descriptive claims, which describe the metes and bounds of the invention, similar to a mining claim that prevents others from mining inside the staked area. However, much like a bad survey can lead to a mining claim that misses a large portion of an ore deposit, patent claims should be carefully drafted to ensure that the patent covers the entirety of the invention. During patent examination, the claims must describe the invention in a way that it is both novel and non-obvious.

A novel invention has never been disclosed in its exact form before. For example, a patent filed for a “Pipe Coupling” that only includes the features of Victaulic’s “Pipe Joint” is not novel based on the “Pipe Joint” patent. Furthermore, any obvious variations on an invention are not patentable. Obvious variations often include combining two known elements into a single product, substituting one known part for another, and finding optimum operating parameters.

What should be patented?

Individuals and business owners file patents for many different reasons. Some file patents with an eye toward enforcement through litigation. Others file patents to show investors how innovative their company is. And some simply file patents for the satisfaction and recognition that they were the first to think of an idea. In the end, filing a patent is a business decision, based on the goals, needs, and market of the business. A clear patent strategy will help companies to decide which discoveries they should protect. Two patent strategies are revenue- and investment-focused patent strategies.

A revenue-focused patent strategy directs a company to file patents based on the anticipated revenues of the invention relative to the

cost of filing a patent. Patent revenues may come from direct sales of a product associated with the invention. However, other patent revenue paths exist. For example, licensing a patent to a third party will generate revenue through royalties. A revenue-focused patent strategy is typically effective for inventions in emerging markets, where the inventor can sell the invention himself, or where the inventor can license the invention to a third party.

In other examples, as soon as a patent is granted, the owner may sue a competitor that is making, using, selling, or importing the patented invention and receive damages for patent infringement. However, patent infringement litigation is often expensive, with costs regularly reaching hundreds of thousands, or even millions, of dollars. Therefore, a revenue-focused patent strategy is also effective for inventions that have a high market value which can offset the high costs of litigation.

An investment-focused patent strategy directs a company to file patents based on the perceived value by investors. For example, startup companies looking for venture funding may advertise to investors the number of patents, both granted and pending, held by the company. Granted patents indicate to investors that the company has a product that is unique and that competition can be limited. Pending patents indicate to investors that the company is serious, willing to invest in its future, and that the company has a good-faith indication that some portion of the product is novel. Therefore, an investment-focused patent strategy is effective for startups looking to distinguish themselves to receive venture funding.

Additionally, inventions are not new forever. A patent expires 20 years from its filing date. After the patent expires, any person or company may make and sell the invention described in the patent. But, knowing that patents expire, during the patent term, many companies continue to improve upon existing products and develop new technologies. By continued development, an innovative company may continue to establish itself in the market, which can result in the company becoming a leader in the industry for years after the initial patent expires. Established companies may indicate to investors patent filing metrics, including the number of patents owned, filed, and granted during a quarter or year. Patent filing metrics provide investors a measure of the innovativeness of the company. More innovative companies are often viewed as more profitable, which attracts investors. Thus, an investment-focused patent strategy is effective for quickly evolving industries, where innovation is a key driver of success.

Business owners should have an understanding of what can be patented, and have a clear patent strategy to achieve their business' needs and goals. Filing a patent can be the first step in the journey from turning an idea into a multi-national corporation. ✨

Mr. Lingard, a registered patent attorney at Ray Quinney & Nebeker, specializes in preparing and prosecuting domestic and foreign patent applications in a variety of technological areas, including heavy material handling equipment, drill bits, metallurgical engineering, materials science, additive manufacturing, rotary steerable systems, downhole power generation and distribution, medical devices, and exercise equipment. Mr. Lingard has experience in identifying products that potentially infringe his client's patents, as well as preparing patentability and patent infringement opinions. Prior to becoming an attorney, Mr. Lingard worked at several mines across the United States and Canada in underground tunneling, shaft sinking, and heavy civil construction.



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At Last, a Vaccine!

What Does It Mean for Employers?

By Abbey Moland, McGrath North

With the FDA's issuance of an Emergency Use Authorization (EUA) for multiple COVID-19 vaccines, and vaccines becoming more widely available, many U.S. employers, eager to safely transition employees back to work or transition workplaces back to normal, are considering implementing vaccine recommendations or mandates in the workplace. The fluidity of the pandemic has yielded yet another decision point for employers – can employees be required to obtain a COVID-19 vaccine as a condition of employment?

At this point, the answer is generally, yes—although there are a number of caveats, open questions, and policy decisions to keep in mind as vaccines become more widely available and federal, state, and local agencies and corresponding legal issues continue to morph and take shape. Here is a look at some of the employment-related considerations with mandating a COVID-19 vaccine in the workplace.

1. Equal Employment Opportunity Commission (EEOC).

On December 16, 2020, the U.S. Equal Employment Opportunity Commission (EEOC) issued a revised version of its ongoing COVID-19 guidance publication, [“What You Should Know About COVID-19 and the ADA, the Rehabilitation Act, and Other EEO Laws.”](#) addressing questions related to the administration of COVID-19 vaccinations in an employment context. The new information, outlined in Section K of the publication, clarifies that employers may require, as a condition of employment, that employees receive the COVID-19 vaccine. However, there are many open questions and significant legal issues for employers to consider under the EEOC's guidance. Some key takeaways for employers from the updated EEOC guidance include:

(a) The COVID-19 Vaccine is NOT a medical exam under the Americans with Disabilities Act (ADA).

First, the EEOC's Guidance clarifies that the vaccine itself is NOT a medical exam. Under the ADA, “medical exams” which are a condition of employment must be job related and consistent with business necessity or be necessitated by a direct threat in the workplace. The EEOC stated that by simply administering a COVID-19 vaccine, employers would not be seeking medical information from the employee and thus, this would not rise to the level of a “medical exam” under the ADA.

(b) Pre-screening Vaccination Questions MAY Implicate the ADA.

For employers who choose to implement a mandatory vaccine requirement, the EEOC guidance provides some additional cautions related to pre-screening questions (which are recommended by the CDC prior to administering a COVID-19 vaccine).

In order to pass muster under the ADA, the pre-screening questions must be “job-related and consistent with business necessity” and to meet this standard employers will need to have a “reasonable belief, based on objective evidence, that an employee who does not answer the questions and, therefore, does not receive a vaccination, will pose a direct threat to the health or safety of her or himself or others.”

In assessing whether there is a “direct threat” the EEOC advises employers to conduct an individualized assessment in taking into considerations the following four factors: (i) the duration of the risk; (ii) the nature and severity of the potential harm; (iii) the likelihood that the potential harm will occur; and (iv) the imminence of the potential harm.



The EEOC makes clear that the concerns about the pre-screening questions will not implicate the ADA where (1) an employer has offered a vaccine on a voluntary basis (i.e. employees choose whether to be vaccinated), which would mean that an employee's refusal to answer the questions, would only mean the employer could refuse to administer the vaccine; or (2) an employee receives an employer-required vaccine from a third party that does not have a contract with the employer (i.e. a pharmacy, broker or other health care provider), the ADA would not apply to pre-screening questions.

(c) Confidentiality Issues.

The EEOC also makes clear that the pre-screening questions (whether voluntary or mandatory) and the responses to those questions should be maintained as confidential information, in a separate file (i.e. not the personnel file), in accordance with the provisions of the ADA. Those employers who administer vaccines themselves, or contract with a third-party provider to administer vaccines, should also be wary of their obligations under the Health Insurance Portability and Accountability Act (HIPAA), as to employer-provided information and vaccination records.

(d) Employee Proof of a COVID-19 Vaccine.

Employers may request and require employees to show proof of receipt of a COVID-19 vaccination. Such a question does not amount to a disability-related inquiry in and of itself. The EEOC cautions employers who ask "why" an employee has not or cannot receive a vaccine. These follow up questions, may elicit information about a disability and would need to be "job-related and consistent with business necessity" in accordance with the ADA. Employers who do wish to require that employees furnish proof of vaccination should instruct employees not to provide any medical information in connection with the vaccination record in order to avoid implicating the ADA.

(e) Disability-related Exemptions to a Mandatory Vaccine Requirement

The new EEOC guidance also provides some direction to employers for responding to employees who indicate they are unable to receive a vaccine due to a disability. The EEOC reiterates that employers can require that employees "not pose a direct threat to the health or safety of individuals in the workplace." However, if a mandatory vaccine requirement has the effect of screening out individuals with disabilities, the "employer must show that an unvaccinated employee would pose a direct threat due to a 'significant risk of substantial harm to the health or safety of the individual or others that cannot be eliminated or reduced by reasonable accommodation'".

The EEOC instructs employers to conduct an individualized assessment of four different factors to determine whether a "direct threat" exists. These include considering: (1) the duration of the risk; (2) the nature and severity of the potential harm; (3) the likelihood that the potential harm will occur; and (4) the imminence of the potential harm."

If an employer concludes there is a direct threat, the EEOC indicates that the employer may "exclude" the employee from the workplace, but cautions employers against terminating the worker without first considering whether there may be an accommodation available. The EEOC advises that employers should engage employees "in a flexible, interactive process to identify workplace accommodation options" and also notes that one factor that warrants consideration may be the prevalence of employees in the workplace who have already received the vaccine.

Practically speaking, it seems this analysis will still hinge on individual circumstances related to things like the nature of the employee's disability, the work conditions, and the ability to mitigate potential hazards through job modifications such as increased social distancing, PPE, telework, etc.

Employees working in high-risk environments or with high-risk populations (i.e. food service and food processing, healthcare, nursing homes, and schools), may have fewer options for accommodating vaccine exemptions, especially given the risk surrounding the efficacy of PPE measures in industries requiring constant exposure and face-to-face close contact. But again, the EEOC guidance makes clear that the number of employees vaccinated will have a bearing on this analysis.

(f) Religious Exemptions to a Mandatory Vaccine Requirement

Similar to the disability-related exemptions, the EEOC guidance reiterates that employers who plan to require a vaccine also provide an exemption where the employee maintains a "sincerely held religious belief" or observance which prevents them from taking the vaccine. This standard is fairly broad and encompasses more than traditional organized religions, but the protection would not extend to employees who seek an exemption due to political beliefs, personal objections to vaccinations, or safety-related concerns with the vaccine. The EEOC notes that as in the case of the ADA, Title VII also allows employers to deny an employee's request for an exemption to a mandatory vaccination if the employer can show an "undue hardship" by allowing the employee to forgo the vaccine. Again, the EEOC makes clear this would hinge on the individual circumstances applicable to each case but would largely depend on the employer's ability to provide alternative protections for the employee, the rest of its workforce and, where necessary, members of the general public.

(g) Genetic Information Nondiscrimination Act (GINA) Implications.

Lastly, the EEOC makes clear that simply administering the COVID-19 vaccine to employees or requiring employees to provide proof that they received the COVID-19 vaccine does not implicate Title II of GINA because it does not involve genetic information as defined by the law. Under Title II of GINA, employers may not use, acquire or disclose an employee's genetic information in connection with their employment, subject to six narrow exceptions.


As with the ADA, pre-screening questions, or where an employee provides more than just proof of a vaccination may still implicate GINA. Accordingly, the EEOC advises that employers should avoid pre-screening questions which implicate genetic information (which should be fairly easy to do) or require employees to obtain the vaccine through their own means and simply provide proof of the same to their employer, without any extraneous medical information.

While the updated EEOC guidance provides certain clarification for employers contemplating workplace vaccination strategies, the exceptions and exemptions under the ADA and Title VII are fact-intensive and will vary widely. Employers who do intend to adopt mandatory vaccination programs are advised to review potential reasonable accommodations for disabilities and sincerely-held religious beliefs and strategize how they will respond to such requests in order to minimize legal exposure under Title VII and the ADA.


2. Occupational Safety and Health Administration (OSHA).

While OSHA has also not yet provided specific COVID-19 vaccination guidance, its longstanding position regarding the flu and other vaccines indicates support for employer mandates so long as employees are "properly informed of the benefits of vaccinations." The agency has caveated this by clarifying that an employee who refuses a vaccine due to a medical condition that the employee reasonably believes would cause serious illness or death may still be protected by Section 11(c) of

★ *Continued on page 28*



Most likely, state workers' compensation coverage would come into play to cover any physical injury, whether due to a vaccine side effect or other physical injury to the employee caused by the vaccine.



★ *Continued from page 27*

the OSH Act, which governs whistleblower claims based on workplace health and safety.

Furthermore, it is worth noting that in its interim guidance issued in May of 2020, OSHA had encouraged its own investigators to obtain the COVID-19 vaccination as soon as it becomes available. There is likewise widespread speculation that OSHA may look to apply the General Duty Clause, OSHA's general citation standard, to issue citations to employers who fail to offer the COVID-19 vaccination to its workforce as an enhanced safety measure. As with the EEOC, additional guidance is expected to shed light on the direction of OSHA's enforcement position on this topic.

3. Workers' Compensation.

On a similar note, what happens if an employer recommends or requires a COVID-19 vaccine for its employees and the employee is injured due to the vaccine?

Most likely, state workers' compensation coverage would come into play to cover any physical injury, whether due to a vaccine side effect or other physical injury to the employee caused by the vaccine. This would generally be true in the case where an employer recommends, requires, pays for, or administers the COVID-19 vaccine at its worksite. On the flipside, workers' compensation coverage would likely not apply in a scenario where an employee obtains a COVID-19 vaccine without the recommendation, mandate or sponsorship from the employer.

Typically, subject to some state-specific exceptions, workers' compensation serves as the exclusive remedy for employees who sustain physical injuries within the course and scope of employment. In other words, an employee would be limited to pursuing workers' compensation benefits and cannot pursue tort claims against the employer absent a showing of willful or more serious conduct. While workers' compensation laws may apply to shield employers from tort claims (i.e. personal-injury type claims) brought by employees who sustain physical injuries as a result of an employer-sponsored COVID-19 vaccine, these same laws may not preclude tort claims against third party entities, such as the vaccine manufacturer

4. National Labor Relations Board (NLRB).

Finally, there are labor considerations for both union and non-union employers in mandating a COVID-19 vaccine. For union employers, requiring a COVID-19 vaccine may be considered a mandatory subject of bargaining triggering an employer's duty to bargain prior

to implementing such a requirement. Employers should review any existing labor agreements for language which precludes or permits such a mandatory vaccination scheme. Second, non-union employers must also be mindful of how implementing a vaccine requirement could implicate Section 7 of the National Labor Relations Act (NLRA), which provides employees the right to engage in "concerted activities" for the purpose of "mutual aid and protection." Practically speaking, employees who join together to speak out for or against a mandatory vaccine requirement, who collectively create outside social media postings or other organized interoffice communications regarding the requirement, or simply discuss the employer-imposed requirement would be protected by federal labor law and generally, cannot be subject to discipline or termination as a result of this conduct. Notwithstanding, even if employees band together in concerted activity under the NLRA, and cannot be disciplined for that concerted activity, they could still be disciplined for refusing to take the vaccine, or even permanently replaced if they choose to go out on a work stoppage.

While the current legal landscape suggests employers, especially those in certain high-essential industries, may be able to require employees to obtain a COVID-19 vaccine, the legal landscape changes almost daily, and there are many open questions, potential public relations pitfalls, and employee morale issues with doing so. Until there is more guidance from the federal, state, and local level on this topic, and more widespread use and availability of the vaccine beyond the healthcare industry, employers may want to consider promoting rather than requiring a vaccine as a condition of employment just as they would a flu vaccine. ★

Abbey Moland is an attorney at McGrath North and counsels Fortune 500, mid-size and start-up businesses, colleges and universities, and non-profits on a wide range of labor and employment matters. Her practice spans across the country in areas including wage and hour compliance, workforce reductions, employee leaves of absence, FMLA and disability accommodations, workplace investigations, hiring practices, disciplinary actions and employee terminations, immigration and workforce authorization, management and employee training on workplace issues, policy formation, union organization, non-compete issues, OSHA investigations, and employee class-action litigation. She is also experienced in defending employment-related litigation and providing day-to-day counseling to avoid unlawful employment practices. Moland can be reached at (402) 633-9566 or amoland@mcgrathnorth.com.



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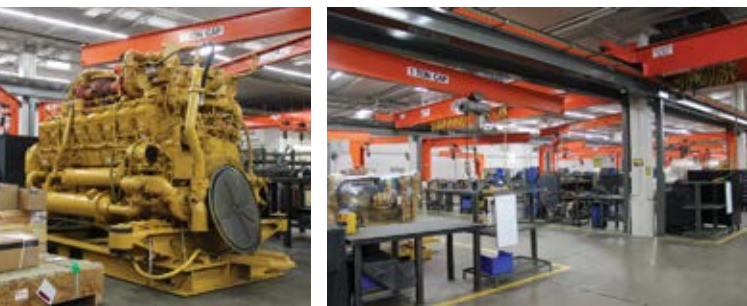


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