2018 U.S. NET IMPORT RELIANCE[1]

Commodity	Percent	Major import sources (2014-17)[2]
ARSENIC (trioxide)	100	Morocco, China, Belgium
ASBESTOS	100	Brazil, Russia
CESIUM	100	Canada
FLUORSPAR	100	Mexico, Vietnam, South Africa, China
GALLIUM	100	China, United Kingdom, Germany, Ukraine
GRAPHITE (natural)	100	China, Mexico, Canada, Brazil
INDIUM	100	China, Canada, Republic of Korea, Taiwan
MANGANESE	100	South Africa, Gabon, Australia, Georgia
MICA (sheet, natural)	100	China, Brazil, Belgium, Austria
NEPHELINE SYENITE	100	Canada
NIOBIUM (columbium)	100	Brazil, Canada, Russia, Germany
RARE EARTHS (compounds and metals)[3]	100	China, Estonia, France, Japan
RUBIDIUM	100	Canada
SCANDIUM	100	Europe, China, Japan, Russia
STRONTIUM	100	Mexico, Germany, China
TANTALUM	100	Brazil, Rwanda, Australia, Congo (Kinshasa)
THORIUM	100	India, United Kingdom
VANADIUM	100	Austria, Canada, Republic of Korea, Russia
GEMSTONES	99	India, Israel, Belgium, South Africa
BISMUTH	96	China, Belgium, Mexico, Republic of Korea
YTTRIUM	>95	China, Estonia, Japan, Republic of Korea
POTASH	92	Canada, Russia, Belarus, Israel
TITANIUM MINERAL CONCENTRATES	91	South Africa, Australia, Canada, Mozambique
DIAMOND (dusts, grit and powder)	89	China, Ireland, Republic of Korea, Romania
ANTIMONY (oxide)	85	China, Thailand, Belgium, Bolivia
ZINC	85	Canada, Mexico, Peru, Australia
BARITE	84	China, India, Mexico, Morocco
RHENIUM	84	Chile, Germany, Belgium, Poland
STONE (dimension)	82	Brazil, China, Italy, Turkey
TIN	78	Indonesia, Malaysia, Peru, Bolivia
ABRASIVES, fused aluminum oxide (crude)	>75	China, France, Hong Kong, Canada
ABRASIVES, silicon carbide (crude)	>75	China, Netherlands, South Africa, Romania
BAUXITE	>75	Jamaica, Brazil, Guinea, Guyana
TELLURIUM	>75	Canada, China, Germany
TITANIUM (sponge)	75	Japan, Kazakhstan, Ukraine, China,
PLATINUM	73	South Africa, Germany, United Kingdom, Italy
CHROMIUM	71	South Africa, Kazakhstan, Russia
PEAT	70	Canada
GARNET (industrial)	68	Australia, India, South Africa, China
SILVER	65	Mexico, Canada, Peru, Republic of Korea
COBALT	61	Norway, China, Japan, Finland
NICKEL	52	Canada, Norway, Australia, Russia
GERMANIUM	>50	China, Belgium, Germany, Russia
IODINE	>50	Chile, Japan
IRON OXIDE PIGMENTS (natural)	>50	Cyprus, Spain, France, Austria
IRON OXIDE PIGMENTS (synthetic)	>50	China, Germany, Brazil, Canada,
LITHIUM	>50	Argentina, Chile, China, Russia
TUNGSTEN	>50	China, Bolivia, Germany, Canada,
ALUMINUM	50	Canada, Russia, United Arab Emirates, China
MAGNESIUM COMPOUNDS	48	China, Canada, Australia, Brazil
ALUMINA	45	Australia, Brazil, Suriname, Jamaica
SILICON	34	Russia, Brazil, Canada, China
PALLADIUM	33	South Africa, Russia, Italy, United Kingdom
COPPER	32	Chile, Canada, Mexico
VERMICULITE	30	South Africa, Brazil, China, Zimbabwe
LEAD	29	Canada, Mexico, Republic of Korea, India
PUMICE	29	Greece, Iceland, Mexico
SALT	28	Chile, Canada, Mexico, Egypt
MICA (scrap and flake, natural)	26	Canada, China, India, Japan
PERLITE	25	Greece, Mexico, Turkey
BROMINE	<25	Israel, Jordan, China
CADMIUM	<25	Canada, Australia, China, Belgium
MAGNESIUM METAL	<25	Israel, Canada, United Kingdom, Mexico
IRON and STEEL	24	Canada, Brazil, Republic of Korea

[1]Not all mineral commodities covered in this publication are listed here. Those not shown include mineral commodities for which the United States is a net exporter (abrasives, metallic; boron; clays; diatomite; gold; helium; iron and steel scrap; iron ore; kyanite; molybdenum concentrates; sand and gravel, industrial; selenium; soda ash; titanium dioxide pigment, wollastonite; zeolites; and zirconium) or less than 24% import reliant (beryllium; cement; diamond, industrial stones; feldspar; gypsum; iron and steel slag; lime; nitrogen (fixed)-ammonia; phosphate rock; sand and gravel, construction; stone, crushed; sulfur, and talc and pyrophyllite). For some mineral commodities (hafnium; mercury; quartz crystal, industrial; and thallium), not enough information is available to calculate the exact percentage of import reliance.

[2]In descending order of import share.
[3]Data include lanthanides

Data from U.S. Geological Survey, 2019, Mineral commodity summaries 2019: U.S. Geological Survey, 200 p., https://doi.org/10.3133/70202434, Page 6.

1995 U.S. NET IMPORT RELIANCE FOR SELECTED NONFUEL MINERAL MATERIALS

ARSENIC	100	China, Chile, Mexico
COLUMBIUM (niobium)	100	Brazil, Canada, Germany
GRAPHITE	100	Mexico, Canada, China, Madagascar
MANGANESE	100	South Africa, gabon, France, Brazil
MICA, sheet (natural)	100	India, Brazil, Finland, China
STRONTIUM (celestite)	100	Mexico, Germany
THALLIUM	100	Belgium, Canada, United Kingdom
YTTRIUM	100	China, United Kingdom, Hong Kong, Japan, France
BAUXITE & ALUMINA	99	Australia, Jamaica, Guinea, Brazil
GEMSTONES	98	Israel, India, Belgium, United Kingdom
FLUORSPAR	92	China, South Africa, Mexico
TUNGSTEN	87	China, Germany, Bolivia, Peru
TIN	84	Brazil, Bolivia, Indonesia, China
COBALT	82	Zambia, Norway, Canada, Zaire, Finland
TANTALUM	80	Australia, Germany, Canada, Thailand
CHROMIUM	78	South Africa, Turkey, Zimbabwe, Russia, Finland
POTASH	74	Canada, Belarus, Germany, Israel, Russia
BARITE	65	China, India, Mexico
IODINE	62	Japan, Chile
NICKEL	61	Canada, Norway, Australia, Dominican Republic
ANTIMONY	60	China, Mexico, South Africa, Hong Kong
STONE (dimension)	57	Italy, Spain, India, Canada
PEAT	55	Canada
MAGNESIUM COMPOUNDS	50	China, Canada, Mexico, Greece, Austria
ASBESTOS	46	Canada
ZINC	41	Canada, Mexico, Peru, Spain
DIAMOND (dust, grit & powder)	36	Ireland, China, Russia
SELENIUM	33	Canada, Philippines, Japan, Belgium, United Kingdom
SILICON	33	Norway, Brazil, Canada, Russia
GYPSUM	30	Canada, Mexico, Spain
PUMICE	29	Greece, Zaire, Turkey, Ecuador
ALUMINUM	25	Canada, Russia, Venezuela, Brazil
CADMIUM	21	Canada, Mexico, Belgium, Germany
IRON & STEEL	21	European Union, Canada, Japan, Brazil, South Korea
NITROGEN (fixed), AMMONIA	20	Trinidad & Tobago, Canada, Former Soviet Union, Mexico
IRON ORE	18	Canada, Brazil, Venezuela, Australia, Mauritania
SULFUR	18	Canada, Mexico
CEMENT	17	Canada, Spain, Greece, Venezuela, Mexico
LEAD	15	Canada, Mexico, Peru, Australia
SALT	15	Canada, Mexico, Bahamas, Chile
SODIUM SULFATE	15	Canada, Mexico
VERMICULITE	15	South Africa
MICA, scrap & flake (natural)	10	Canada, India
PERLITE	8	Greece
COPPER	6	Canada, Chile, Mexico
RARE EARTHS	2	Australia
LIME	1	Canada, Mexico

Additional commodities for which there is some import dependency include:

Bismuth	Mexico, Belgium, China, Peru
Gallium	France, Germany, Russia, United Kingdom, Hungary
Ilmenite	South Africa, Australia, Canada
Indium	Canada, France, Italy, Belgium, Russia
Iron & steel slag	Canada, Japan
Kyanite	South Africa, France
Mercury	Canada, Russia, Germany
Platinum	South Africa, United Kingdom, Belgium, Germany
Rhenium	Chile, Germany, United Kingdom, Russia, Kazakstan
Rutile	Australia, Sierra Leone, South Africa
Silver	Mexico, Canada, Peru, Chile
Thorium	Australia
Titanium (sponge)	Russia, Japan, China
Vanadium	Russia, South Africa, Canada, Mexico
Zirconium	Australia, South Africa

Data from U.S. Geological Survey, 1996, Mineral commodity summaries 1995: https://minerals.usgs.gov/minerals/pubs/mcs/1996/nir.gif

EXHIBIT I

***You Say Alternatives are the Answer…Let's Talk: Resource Constraints on Alternative Energy Development*, Burnell, J. R., American Institute of Professional Geologists, *in*, The Professional Geologist, March/April 2009 pp. 33-37**

YOU SAY ALTERNATIVES ARE THE ANSWER ...LET'S TALK:

Resource Constraints on Alternative Energy Development

James R. Burnell, MEM-0205

Abstract.

Public support is growing for the development of energy generation from renewable sources. An aspect of renewables that is possibly unknown by many, however, is the hardware needs for these technologies. The infrastructure requires mined materials, including imported strategic and critical minerals. Silica, copper, gallium, indium, selenium, cadmium and tellurium are required for the dominant photovoltaic technologies. Silver and aluminum are necessary for "concentrating solar power" technology. Zinc, vanadium, platinum group metals, and rare earth elements are key components of power storage, hybrid vehicle, and fuel cell applications. All these materials must be mined. At present, the U.S. is woefully dependent upon import sources for most of these materials and demand is already squeezing the prices. Domestic sources must be found and developed if energy independence is to be achieved using alternative sources.

Key Words: alternative energy, mineral commodities

Introduction

In the early 21st century, rapid economic growth in areas outside the traditional sphere of industrialized nations has led to a steady rise in demand for energy and mined commodities. In particular, the economies of large "BRIC" countries (Brazil, Russia, India, and China) have been growing in the range of 8-9% per year; additionally these nations account for 42% of the world's population (Mohanty, 2007). These factors have collided with a concern in North America and the European Union over the amount of carbon dioxide exhaled to the atmosphere by the combustion of fossil fuels. The concern over carbon dioxide and other "greenhouse gases," has given momentum to a movement away from coal, oil and natural gas toward the "alternative" energy sources.

While a debate simmers over connections between "global warming" and use of fossil fuels, few participants on either side of the debate deny the desirability of increasing the use of "green" energy sources. In a world where energy demand is conservatively predicted to increase 57% from 2004 to 2030 (U.S. Energy Information Agency, 2008) the recognition of finite supplies of fossil fuels alone drives the need to research, develop and implement alternatives as soon as possible.

As attractive as alternatives appear on the surface, they are not without significant problems within these next transition decades. There appears to be a misunderstanding regarding the feasibility of quick (in terms of time) and affordable (in financial terms) implementation of various alternative energies. Society should be cautious of the temptation to quickly eliminate reliable conventional sources of energy such as coal and nuclear during the transitional decades.

Unfortunately, there is no "free lunch." This paper reviews some of the most promising alternative energy options from the point of view of assessing the resource needs for those options. For most energy alternatives, the hardware or infrastructure requirements are significant, the prices for the necessary commodities are experiencing remarkable increases, and, unfortunately for the U.S. economy, we are dependent upon imports for much of our supply. Exploring the U.S. and mining these materials domestically would certainly help the U.S. trade balance, provide many more good jobs domestically, and help assure supply in a competitive world economy where many nations are bidding for the same materials.

Note that much information about technologies and materials is tightly guarded for competitive reasons. Markets for most of the subject commodities are not controlled. Hence, some of the comments herein are based on anecdotal information that can't be referenced as in a purely scientific paper.

Energy Alternatives

Solar Power

Photovoltaics. Discussions with personnel at the National Renewable Energy Laboratory (NREL) in Golden, Colorado, have confirmed that there are currently three leading technologies in the realm of photovoltaics – high-purity silica, and two thin-film technologies CIGS (copper-indium-gallium diselenide) and Cadmium-Tellurium (Cd-Te). Trade-offs exist among these three technologies, for both cost and efficiency. A good reference for the topic of efficiency can be found in the discussion by Emery (2004).

The silica used for photovoltaics is derived from ultra high-purity quartz. Information on that industry can be found in Schlanz (2006). While not an exotic mineral commodity, silica still must be mined and processed for use as a photovoltaic substrate (Benner, 2007).

Thin-film technologies have risen in popularity in the last few years as they have achieved improved efficiency. The four commodities used in the CIGS technology are available in varying amounts on the world market, but copper, indium and gallium have experienced significant demand increases for their other uses.

Copper won't be discussed in detail, as its economic geology is better known. Its corrosion resistance and electrical conductance make copper a standard in the construction, electronics, and utilities industries. Copper supply – especially because of infrastructure development in the BRIC countries – has been very tight and the copper price has increased over 400% in just the last 5 years.

Indium is a less known metal. Indium is a soft, silvery-white metal with a very low melting point and growing importance in today's technological economy. Used in liquid crystal displays (LCDs), flat panel displays, optical coatings, light-emitting diodes (LEDs), antistatic coatings, strain gauges, gas sensors and other low-melting alloys, much of our indium derives from base-metal sulphide deposits. The demand for indium is high and increasing.

Gallium is also found in the mineral sphalerite as well as diaspore and bauxite. One of the few metals stable as a liquid near room temperature, gallium is also a silvery grey metal. The metal is indispensable in the electronics industry, as gallium arsenide and gallium nitride, in integrated circuits, optoelectric devices including LEDs, laser diodes, and photodetectors, as well as specialty alloys.

While not a rare element, ***selenium*** is obtained primarily from anode slimes in the electrolytic refining of copper. It is used as a dietary supplement, in anti-dandruff shampoo, as a glass additive, a catalyst, an alloying agent, and traditionally in the photocopying process and in rectifiers in the electronics industry.

In addition to the four named components of the CIGS technology, current formulations also utilize tin, zinc, cadmium and molybdenum, all of which are, of course, mined. (Nuofi and Zweibel, 2007).

A second promising thin-film technology is Cd-Te. ***Cadmium*** has garnered disfavor because of its toxicity and solubility, as it commonly occurs as an environmental pollutant from sulfide deposits. Tellurium is one of the least common elements in the earth's crust (Krauskopf, 1967). Supply has come under pressure since 2006, presumably a result of the move to market of a new data-storage device (Weiss, 2005). In addition to the traditional uses in alloys and as a catalyst and vulcanizing agent, telurium's thermoelectric properties have opened its use in thermal cooling devices (e.g. quiet-running water coolers). The primary source of tellurium, just as selenium, is as a by-product of copper refining. As more copper is refined using hydrometallurgical techniques, this source of selenium and tellurium is diminished.

Concentrating Solar Power. Thermal concentrating solar power (CSP) is a promising technology whereby sunlight is reflected by mirrors in a tower, trough or parabolic array onto a vessel containing a gas or a heat transfer liquid (HTL - water, oil or molten salt.) The focused sunlight heats the fluid, which is transmitted along the tube to an electric generating system. Reflectors are commonly equipped with the ability to move, tracking the sun for maximum incident sunlight.

A variety of mineral commodities are used for the different models, configurations and functions in CSP systems. Most of the mirrors use silver (Kennedy and Jorgenson, 1994; Price and Kearney, 1999), although polished aluminum is also used (A. Walker, NREL, personal communication.) The solar concentrator materials have been difficult to identify, presumably for business confidentiality reasons. One system identifies a "specially coated absorber tube embedded in an evacuated glass envelope" (Schott North America, 2008). It seems certain that some sort of molybdenum-alloy, stainless steel is necessary for concentrators and associated tubing that use molten salt or corrosive water.

Hybrid And Alternative Vehicles

The search for a replacement for the internal combustion engine is moving along two main tracks – one to completely replace gasoline engines, the other to augment them. In the first lies the hope and promise of the hydrogen-powered automobile, the second combines an existing internal combustion engine with electric power stored in batteries. The first uses the fuel cell technology, the second advanced batteries. Because power storage and battery technology is treated later, this section concentrates on the needs of fuel cell technology and other aspects of hybrid vehicles besides the batteries.

A fuel cell is a device in which hydrogen is reacted with oxygen to produce water and electricity; that electricity is used to power the vehicle. The reaction requires a catalyst, typically (and most efficiently) composed of platinum group elements (PGEs) platinum, palladium and, in some cases, ruthenium. Much current research is focused on finding substitutes for PGEs in fuel cells (U.S. Department of Energy, 2005). Platinum and its close relatives have numerous uses, including catalytic converters, electronics and electrical components (such as thermocouples and hard disk drive coatings), automobile catalytic converters and in petroleum catalysis, neurosurgical apparatus, and glass, and, of course, in jewelry and as an investment vehicle.

Hybrid vehicles use both electric power stored in batteries and gasoline power. According to the European Copper Institute (2008), a current non-hybrid model car contains about 25 kg (55 lb) of copper; the use of electric motors in hybrid vehicles contain significantly more copper – an additional 12 kg (25 lb) (Stablum, 2007). Chavasse (2005) reports that 75 kg (165 pounds) of cobalt and 16 kg (35 pounds) of nickel are also used in a typical hybrid vehicle for the unique engine and battery components, as well as 22 kg (48 pounds) of rare earth elements (REE) for batteries and magnetic components (Schiller, 2008). The REE, also known as the Lanthanide Series, consist of elements 57 to 71 on the periodic table of the elements. The main REE used in the magnets are samarium, neodymium, holmium, gadolinium, praseodymium and dysprosium.

Batteries

If alternative power sources are to gain larger market share, battery technology must improve. Wind and solar power are seductive, but must be augmented with a baseload power source to provide electricity when the sun isn't shining and the wind isn't blowing. While using traditional baseload power from coal or nuclear plants is an excellent start, the ability to use the renewable sources around the clock is a desirable goal. If that is to be accomplished, "utility-scale" batteries are needed. More compact, lower-capacity batteries are required for hybrid vehicles.

Battery technology is a very active field, just like fuel cell technology, and new developments are announced weekly. This review can't cover all developments, but will simply summarize some commonly known battery types and review the resource requirements of the batteries. A summary of battery types can be found on a Sandia National Laboratory website (Sandia National Laboratories, 2008).

Batteries that can be used for utility-scale operation include lead-acid, and a family of batteries known as "flow batteries," including vanadium redox, zinc-cerium and zinc-bromine batteries. Nickel-metal hydride and the lithium ion battery types are being developed for larger-scale use.

Mineral commodities used in the various batteries are included in Table 1.

The addition of battery materials creates a Hot List of 18 mined commodities (counting the PGMs and REEs) used in the alternative energy field - aluminum, bromine, cadmium, cobalt, copper, gallium, indium, lead, lithium, molybdenum, nickel, PGEs, REEs, selenium, silver, and tellurium, vanadium, and zinc.

Concept Of Critical And Strategic Minerals

Critical and strategic minerals have been defined since the First World War era as commodities necessary to the economic well-being of the United States, but subject to supply interruption or restriction in supply because of the nation's dependence on imports (National Research Council, 2008). Many of the materials on the alternative energy Hot List fall into the category of critical and strategic minerals.

Data show that the U.S. is wholly dependent on foreign sources for indium, vanadium, alumina, rare earth elements, and almost completely dependent for gallium, platinum group metals, and cobalt (figure 1.)

Vanadium Redox	Zinc-Cerium	Zinc-Bromine	Lead Acid	Nickel Metal Hydride	Lithium Ion
Vanadium	Zinc Cerium	Zinc Bromine	Lead	Nickel REE	Lithium Cobalt others

Table 1. Commodities in various battery types. (Wikipedia, 2008)

These commodities have additional conventional uses. Vanadium is a particularly important metal for use in specialty steel alloys and as a catalyst. Zinc has myriad uses, from galvanizing steel to pigments, brass and bronze, and the chemical industry. (U.S. Geological Survey, 2008). The REE (including cerium) are also ubiquitous in industry in catalytic converters, high-strength magnets, petroleum refining catalysts, phosphors for computer monitors and televisions, medical and laser applications and as heavy absorbers for nuclear reactors (U.S. Geological Survey, 2008). Nickel is in great demand for stainless steel, but is also used in superalloys, and electroplating (U.S. Geological Survey, 2008, Mineral Information Institute, 2008). In addition to batteries, lithium is used in ceramics and glass, lubricants, pharmaceuticals, air conditioning and various other uses (U.S. Geological Survey, 2008). Cobalt is used in superalloys for the aircraft and aerospace industries, but also as wear-resistant coatings, prosthetics, magnetic alloys, catalysts, recording material, and numerous others (Cobalt Development Institute, 2008).

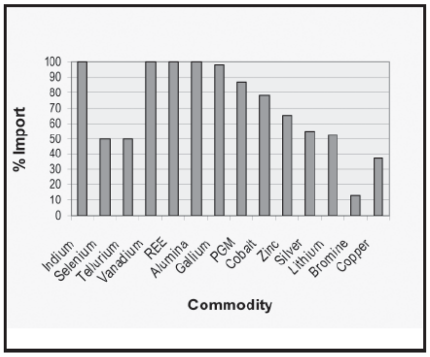

Figure 1. Import dependence of Hot List commodities. The U.S. is a net exporter of molybdenum, lead, and cadmium, so they have not been included on the chart. Import percentage for selenium and tellurium are not available (U.S. Geological Survey, 2008).

The source of the imports is also important when considering the possibility of supply interruption. Sources and supplies of mined commodities are complicated to track down. Belgium, for example, is listed as a leading exporter to the U.S. of several base metals (U.S. Geological Survey, 2008), but there are no base metal mines in Belgium. The country imports ores from former colonial countries in Africa, but also from the other countries, including the U.S. and Thailand. So Belgium is listed as the source, but the ore is mined elsewhere. Table 2 is a compilation, mainly from the U.S.G.S. Commodity Statistics and Information website, for the sources of the commodities important to the renewable energy industries.

Commodity	Principal Producers
Aluminum	Guinea, Brazil, Australia, Jamaica
Bromine	Israel
Cadmium	*U.S.Net Exporter*
Cobalt	Congo, Australia, Cuba
Copper	Canada, Chile, Peru
Gallium	China, Ukraine
Indium	China
Lead	*U.S.Net Exporter*
Lithium	Chile
Molybdenum	*U.S.Net Exporter*
Nickel	Canada
PGE	Russia, Ukraine, Canada, South Africa
REE	China
Selenium	Belgium, Canada, Philippines
Silver	Mexico, Canada, Peru
Tellurium	Belgium, Canada
Vanadium	Swaziland, Czech Rep., South Africa
Zinc	Peru, Canada, Mexico

Table 2. Main producers of Hot List commodities. The countries listed are not always the countries where the mineral is mined [19].

The U.S. relies upon imports for nearly all the mineral commodities necessary for various alternative energy technologies. Just as with petroleum, some of the sources can't be considered secure and reliable. Some of the nations where these materials are mined are politically unstable. Others are direct competitors with the U.S. for the metals they produce. The possibility exists that competing countries will limit supply of critical materials. As an example, in 2007 China limited exports of indium to maintain raw materials for their own domestic industries [Reuters, 2007; ChinaMining.org, 2007]. Without raw materials developing or maintaining industry is difficult with the sorts of high-paying manufacturing jobs that are a common theme in economic development.

The next obvious issue is cost. China's explosive economic development alone has contributed to what many are referring to as a "commodity supercycle" (The Northern Miner, 2007). The prices of mineral commodities have risen remarkably in this millennium. The most familiar rising mineral price is that of gold, briefly exceeding $1000/ounce in March 2008. Platinum, also a precious metal and a member of the Hot List reached a record high of $2250 per ounce in February 2008. Meanwhile, palladium, platinum's sister PGM and, along with Pt indispensable for fuel cells and other catalyis applications, soared to $579 per ounce, also in February [2008].

Several other metals are shown on figures 2 – 4.

Many of these commodities are traded in a thin market and their prices are volatile. Commodities such as selenium, tellurium, indium and gallium are subject to price spikes as their applications expand. Growth of alternative energy technologies is the sort of market perturbation that will increase prices of the metals significantly. Without a doubt, the increasing dependence on these technologies will stress supplies; this should also stimulate additional exploration, development and, for minor metals, increased interest in recovering the trace amounts during the processing of copper and zinc. Nonetheless, supplies will diminish in the short and medium term and prices increase until new production can be brought on. This does not bode well for the decrease in prices that have been anticipated with maturing renewable energy technologies.

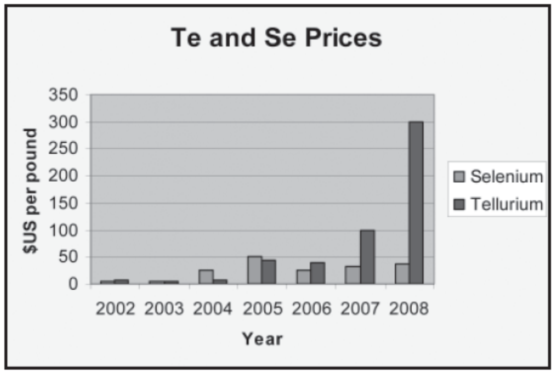

Figure 3. Prices of selenium and tellurium from 2002 to 2008. The 2007 and 2008 prices for tellurium do not reflect an average price, but demonstrate price spikes that were experienced during the year. (U.S. Geological Survey, 2008; Anthony, 2008).

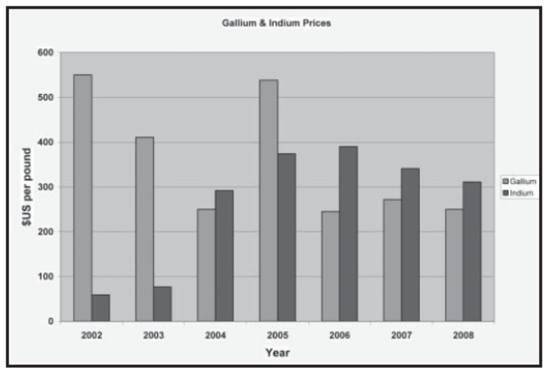

Figure 4. Average annual prices of Indium and Gallium. (U.S. Geological Survey, 2007, www.Asianmetal.com, 2008).

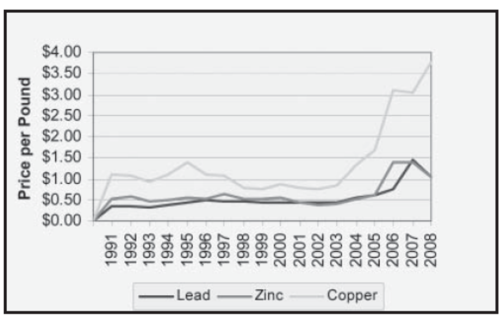

Figure 2. Average annual prices for base metals copper, lead and zinc from 1991 to June 2008. Copper, in particular, is a key component in wind power and solar power systems and hybrid vehicles. The price of copper reached $3.77 per pound in mid-2008 (www.kitco.com).

Conclusions

The conclusions from this summary are clear.

1. Most alternative energy technologies require scarce strategic metals for their fabrication and operation.
2. Increasing use of these technologies will be constrained by global supply and price issues with the metals.
3. Policy makers in the U.S. should consider a constructive attitude toward exploration and development of strategic commodities necessary for "green" energy. The move toward some degree of self-sufficiency for these commodities would not only help the U.S. balance of trade, but provide good jobs in mining and a stronger possibility for jobs manufacturing renewable energy hardware domestically rather than importing it.
4. Discussions about increasing "green" energy are generally inconsistent with anti-mining policies.

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EXHIBIT II

James Cress' January 24, 2007 Testimony Before the House Natural Resources Committee/Energy and Natural Resources Subcommittee

Full Committee Hearing: Oversight Hearing to Receive Testimony on Reform of the Mining Law of 1872

Energy and Natural Resources Committee
United States Senate

Statement of James F. Cress
Partner, Holme Roberts & Owen LLP

January 24, 2007

Mr. Chairman and members of the committee,

My name is Jim Cress, and I am testifying today as a mining lawyer in private practice on the subject of mining royalties. I am a partner at Holme Roberts & Owen, a 109-year old law firm that represented miners in Colorado in the late 1800's and today represents mining companies around the globe. I have specialized for nearly 20 years in U.S. and international mining law, as well as oil and gas and coal law. I have represented mining companies and landowners in negotiating royalties for gold, silver, copper, coal, uranium, oil and gas and other minerals, and have advised clients on royalty compliance for private, federal and state royalties and severance taxes. In my international practice, I have negotiated royalty and tax sharing agreements with governments from Asia to the Americas. I have taught in the Graduate Studies program in Natural Resources and Environmental law at the University of Denver Sturm College of Law, am a contributing author to the Rocky Mountain Mineral Law Foundation's American Law of Mining treatise, and am the former Chair of the Mineral Law Section of the Colorado Bar Association. Thank you for the opportunity to appear and speak on the important issue of hardrock mining royalties.

A royalty on hardrock minerals can and should be structured to promote a fair return to the public and a viable domestic mining industry. Fairness and continued viability of hardrock mining on federal lands should be the cornerstone of any royalty regime.

SIGNIFICANT PROBLEMS WITH A GROSS ROYALTY

A gross royalty will adversely impact investment in mining projects compared to a net royalty

A royalty assessed on gross income increases the economic risk of a given mining investment, and acts as a disincentive to investment. As a consequence, a company looking to develop a project will require a higher required pretax and after-tax rate of return to accommodate the increased risk. Because a royalty assessed on net income has a smaller effect on the variability of after-tax rates of return, it is a better basis for assessing a royalty.

The difference between these two royalty methodologies becomes even more evident when volatility in commodity prices are taken into consideration. Simply put, as commodity prices decrease, the rate of return required to justify a mining investment increases more dramatically under a gross royalty than under a net royalty. Because the other costs of the mining operation are relatively fixed, the gross royalty takes a bigger bite out of the shrinking income pie as prices decrease.

Because the royalty assessed on gross income will cause a larger reduction in after-tax income when profits are low (or negative) than a royalty assessed on net income, the royalty on gross income can exacerbate industry downturns by causing a greater reduction in the cash flows of mining companies when profits are low. In this way, gross royalties are inconsistent with the principle of sustainable development. A gross royalty reduces the volume of an ore deposit that can be recovered. Each deposit of metallic minerals will have varying grades of mineral, generally requiring extensive concentration and refining to be marketable. The portion of the deposit with grades too low to be recovered economically is either removed as waste or left undisturbed in the ground. A gross royalty raises the "cutoff point" between recoverable ore and waste, shortening the life of a mine by causing what otherwise would be valuable minerals below the cutoff point to be lost. These lost reserves generally can never be recovered, because once the mine is closed and reclaimed, the stranded reserves are usually uneconomic to recover on their own.

A gross royalty is not a fair measure of the value of hardrock minerals in federal lands

Any royalty payment to the United States for hardrock minerals should be based on the value of the United States' ownership interest in the land. That interest is limited to the minerals in the ground, and it cannot justifiably be extended to require a royalty to be paid on values added by the mining company after mining, through processing, refining and selling the mineral products. The United States makes available raw land, and any minerals in the land for development, but the United States contributes nothing to the costs and effort of discovering, mining, processing and transporting the minerals to market. In addition, the mineral potential of the millions of acres of federal land is not uniform, and a royalty needs to be set low enough to provide an incentive for mineral exploration across a broad range of lands with differing mineral potential.

A gross royalty is punitive in periods of low commodity prices

Since a gross royalty approach generally does not allow deductions for mining costs, a mining company would have to pay the royalty regardless of how high those costs may be for difficult mining situations or for low grade ores. This would require a mining company to continue paying a royalty even when it is operating at a loss, and that royalty could even cause the loss. No mine can be operated long at a loss. The result would be that some mines would shut down prematurely, creating loss of jobs, federal state and local taxes not paid, and suppliers of goods and services suffer. The result is lost economic benefits affecting both those directly involved in the mining activity and the governmental entities, including the United States, that are sustained by those activities.

Moreover, the premature loss of a mine before maximum economic recovery of the mineral deposit is achieved is a blow to the sustainable development of our natural resources, since some of the impacts of the operation will be felt without maximizing the benefits to society and affected communities. In times of high prices, mining operations can be expanded to recover lower grade or harder to process minerals, because the higher prices support the additional costs of recovering these minerals. A gross royalty can erode this ability to maximize recovery of the entire deposit.

A net proceeds or net income royalty, in contrast, does not cause a mining operation to operate at a loss. A net royalty automatically reduces during periods of low prices and increases again when prices are higher, permitting mining operations to weather periods of low commodity prices and maximize the recovery of marginal ore during periods of high prices.

Due to the cyclical nature of demand for mineral commodities, there have been and will always be periods of lower commodity prices. A net royalty provides the best incentive to explore for minerals on federal lands throughout economic cycles.

A gross royalty unfairly imposes a different levy on different minerals, while a net royalty is generally more equitable among minerals

Gross income is closer to net income for some minerals than for other minerals, resulting in a distortion between minerals if the royalty is based on gross income. For example, the end of the on-site mining process for a gold mine is typically a "doré" of 90% gold mixed with silver and other metals, which is then refined into 99.5% pure gold at an offsite refiner. The end of the on-site mining process for a copper mine is a typically a concentrate that is much further from the final refined copper product. A gross royalty applied at the end of the on-site mining process thus has a disproportionate impact on these two very different mineral products.

A net proceeds or net income royalty cannot overcome the fact that income for royalty purposes will be determined at different points for different minerals, but it promotes more equal treatment of minerals by allowing deductions for the differing cost structures of various minerals, mining methods and scales of operation. If one mineral requires more extensive processing than another, this will automatically be taken into account by permitting a deduction of the higher costs of the more processing-intensive mineral.

ROYALTY RATE

Determining what rate is appropriate to apply across dozens of commodities and millions of acres of federal land with differing mineral potential should not be a matter of opinion or guesswork. Congress should look closely at the type and rate of hardrock mineral royalty that has worked in states and countries that have maintained vibrant mining industries. Nevada's net proceeds approach is particularly worth studying, as an example of a regime that has been in place for decades during which time mining has remained a critical part of the state's economy.

ADMINISTRATION OF A ROYALTY

Complexities exist in any royalty approach, so the goal should be a fair return

The gross royalties currently imposed on oil and gas, coal, and trona, potassium and other bedded deposits are not simple to administer. Detailed regulations of the Department of the Interior contain complex processing deductions for gas, coal washing allowances, and transportation deductions. Any royalty regime for hardrock minerals is likely to be even more complex, because the Department will be faced with a greater number of mineral commodities, disparate mining and processing methods, and differing scales of operation. Complexity is thus unavoidable, and the priority of Congress in fashioning a hardrock royalty should be achieving a fair return rather than chasing the illusory goal of simplicity of administration.

Even the gross royalty proposed in H.R. 2262 will not avoid controversies in administration. H.R. 2262 contains a gross income royalty based on the definition of "gross income from mining" for depletion purposes under Section 613(c) of the Internal Revenue Code. Currently, the Federal courts are split on exactly where the "mining" process ends under Section 613(c) for the solvent extraction/electrowinning (SX/EW) method of recovering metals from solution. One federal circuit has held that the end of the mining process occurs after solutions are extracted and concentrated (the end of the solvent extraction phase). Sunshine Mining Company v. United States, 827 F.2d 1404 (9th Cir. 1987). Another circuit has held that "mining" concludes only after the metal is deposited onto cathodes from solution using an electrolytic procedure (the end of the electrowinning phase). Ranchers Exploration & Dev. Corp. v. United States, 634 F.2d 487 (10th Cir. 1980). H.R. 2262 incorporates all of these complexities into the federal royalty system, along with the potential for different interpretations by the Department of the Interior and the Internal Revenue Service on the same issues. H.R. 2262's approach is not a recipe for either fairness or simplicity of administration.

A net proceeds royalty can more fairly be applied uniformly across different minerals and mining methods

The "fairest" royalty regime would be tailored to the individual characteristics of each mineral deposit after the characteristics of the deposit were known, but such a system would be difficult if not impossible to administer and the uncertainty regarding the amount of the royalty would act as a disincentive to mining investment. A royalty based on net income or net proceeds can be applied to many different minerals, mining methods and sizes of mining operation without the need to differentiate between the types of minerals being produced. Because it is based on revenues less allowable costs, the net calculation can be applied across different minerals, mine methods and scales of operation.

A net proceeds royalty can be structured to ameliorate concerns about administration of the royalty

Specifying the definition of "income" for royalty purposes and permissible types of deductions in the statute itself can help provide an appropriate balance between ease of administration and maintaining a strong, viable domestic mining industry. For example, the Nevada net proceeds of mine tax is based on a list of permissible deductions contained in the statute itself, with some of the details of those deductions elaborated in the Nevada regulations. A federal hardrock royalty should also specify the definition of income and permissible deductions.

Hardrock royalty enforcement provisions should not slavishly follow oil & gas precedent

Royalty enforcement and compliance provisions should be simple and designed to give the Department of the Interior adequate enforcement authority. They should not be slavishly modeled on existing enforcement statutes, or some royalty enforcer's "wish list" of enforcement authority as H.R. 2262's provisions appear to be. Many of the enforcement provisions of H.R. 2262 appear to be closely modeled on the provisions of the Federal Oil & Gas Royalty Management Act of 1982 ("FOGRMA"), 30 U.S.C. §§ 1701 et seq., Pub. L. No. 97-451, § 2, 96 Stat. 2448 (1983). FOGRMA was enacted to address the historical problem of theft of "hot oil" from federal lands as documented by the Linowes Commission. *See* Report of the Commission on Fiscal Accountability of the Nation's Energy Resources, U.S. GPO 1982-0-366-617/523 (1982). No such historical abuses exist for hardrock mining operations, and some of the provisions of FOGRMA (duties imposed on third party transporters, for example) make little sense in the hardrock context.

Other royalty enforcement provisions of H.R. 2262 go well beyond FOGRMA's requirements, for no apparent reason. These include the requirement that any "person paying royalties" essentially assume all liability for correct payment on behalf of the claim owners. H.R. 2262 also exceeds the requirements of any other federal royalty statute by requiring retention of royalty records for seven years after bond release for a hardrock mining operation, which may mean decades of record retention for any mine that operates for 10 or 20 years, a back-door attempt to avoid any meaningful statute of limitations for royalty audits. The Department's audit authority is also inexplicably broader than under FOGRMA, extending to all third parties that are directly or indirectly involved with production or sale of minerals. The Department is authorized to impose penalties for underpayment that far exceed the penalties provided under FOGRMA, again without any legislative history or basis for these more onerous requirements. Penalties are provided for without FOGRMA's six year statute of limitations on enforcement of those penalties. H.R. 2262 imposes joint and several liability on all owners of any interest in a claim for royalties on "lost or wasted" minerals from a claim, which will inject both the Department and every owner of an interest in a claim into second-guessing the mining and processing methods for development of the claim. This provision in FOGRMA addressed a documented issue with unauthorized flaring or venting of gas from oil and gas wells, which has no parallel in hardrock mining operations. These provisions appear to be solutions to problems not shown to exist in the hardrock context.

Enforcement provisions for a hardrock royalty should include a reasonable statute of limitations, not exceeding six years, for record retention and government claims for underpayment of royalties. The enforcement provisions should also allow for a hearing on the record in the event that penalties are imposed for underpayment. Interest should be chargeable for both underpayments and overpayments of royalties, at the same rate. Congress should not incorporate wholesale provisions from oil & gas statutes that were designed to redress problems that have not been shown to exist for hardrock operations.

Any hardrock royalty legislation should allow for royalty reductions and waivers on a case by case basis

All current federal royalty statutes for oil and gas, coal and other minerals permit the Department of the Interior to grant royalty waivers and reductions on a case by case basis. The same flexibility should be provided in any hardrock mining statute. In order to avoid administrative complexity, any hardrock royalty will probably have to be applied in a fairly uniform manner across a large number of commodities and mining and processing methods. Any inequities created by this broad brush approach can be partially addressed by providing a mechanism for specific operations to apply for royalty relief, in order to address economic hardships or to maximize the economic recovery of minerals from each deposit.

TRANSITION RULES FOR A NEW ROYALTY SHOULD BE LEGALLY DEFENSIBLE AND FAIR TO AVOID POTENTIAL TAKINGS LITIGATION AND PROMOTE CERTAINTY

A grandfathering of at least some existing unpatented mining claims from the new royalty is both required by law and required to treat fairly parties that have made significant investments in federal lands prior to the enactment of the royalty. Moreover, it may be advisable to grandfather some claims that may not constitute fully vested property rights, in order to have a simple, bright-line test for which claims are subject to the new royalty, which will reduce uncertainty, reduce administration and litigation costs for the government and promote mining investment.

It is settled law that unpatented mining claims supported by a "discovery" of a "valuable mineral deposit" create Constitutionally-protected property rights in the owner of the claim. Imposition of a royalty on such claims is likely to trigger significant "takings" litigation against the government. A royalty is in no way comparable to the imposition of simple federal filing requirements on unpatented mining claims, which was upheld by the Supreme Court in United States v. Locke, 471 U.S. 84 (1985). Grandfathering claims with a valid discovery as of the date of enactment from the royalty is thus the minimum transition approach that is legally defensible, as Professor Leshy agreed in his prior testimony before this Committee.

The problem with protecting only claims with a valid discovery is that determining which of the hundreds of thousands of mining claims has a discovery would be an unprecedented administrative challenge for the Department of the Interior. Under a long line of court cases and administrative decisions, a mining claim does not have to be currently producing to support a "discovery"; a reasonable prospect that the claim could be profitably mined is sufficient. Currently, the Department requires an administrative hearing in order to contest claims for lack of a discovery. Due process requires a hearing for claimants on this issue. The Department has limited staff trained in the specialized rules applicable to determining whether a "discovery" exists. It would be unworkable for the Department to adjudicate hundreds or thousands of these mining claim validity cases to determine which claims can be legally subjected to a new federal royalty.

To avoid the royalty transition becoming an administrative gridlock, Congress should apply the royalty only to claims located after the enactment of the law or to claims that are included in a plan of operations approved by the Department prior to the date of enactment (without a requirement for commencement of commercial production). Having a "bright line" test will save administrative costs and will also promote certainty about the application of the new royalty, which will encourage investment.

IT IS INHERENTLY UNFAIR TO APPLY APPROACHES FROM COAL, OIL AND GAS OR PRIVATELY NEGOTIATED ROYALTIES

Hardrock minerals are different, and should be treated differently than coal and oil and gas

Why should hardrock minerals not be subject to the 8 percent or greater royalty imposed on oil & gas and coal? The dramatically different characteristics of the minerals themselves and the ways in which they are explored for and developed justifies different treatment.

Oil and gas are fluid and usually collect in sedimentary basins. Exploration for oil and gas usually consists of seismic studies to detect the type of structures where oil and gas are found. These studies are conducted at relatively low cost and usually without the need to acquire more than an easement over the property to be explored. When a promising prospect is identified leases are acquired, a well is drilled and core samples, drill stem tests and logs are taken to determine whether the well is successful. The costs of drilling can sometimes be quite high, but a single well can also drain a large area because of the fluid characteristics of oil and gas. Development of a field is usually accomplished through initial exploratory wells followed by development wells that are drilled in locations reasonably expected, as a result of the information gathered from seismic studies and the initial wells, to maximize production from the same reservoir. Once one or more exploratory wells have discovered an oil and gas pool, identification of the size and shape of the reservoir can be conducted with relatively low risk and expense.

After extraction, oil must be processed and refined before it is ultimately consumed as vehicle fuel or other product. The royalty on oil produced under federal leases is not based upon the value of these refined products, however; it is measured by the value of the crude oil at the lease or wellhead, prior to such processing and refining. Unlike many other minerals, there is a market for oil in its crude, unrefined state and therefore a ready value for royalty purposes before the value added by refining and processing. Most oil is sold at the wellhead into this crude oil market and that wellhead sales price establishes the value of the oil for federal royalty purposes. Thus, it is somewhat misleading to call the federal royalty on oil a "gross" royalty. Because the royalty is typically based on the value of the crude oil prior to processing and refining, the royalty is, in essence, "net" of those costs, equivalent to a net or mine mouth royalty on the value of raw ore in a hardrock operation.

Similarly, federal royalty on gas is also based upon the value of the gas at the lease. After gas is extracted, often the only thing required for consumption by the ultimate end-user is transportation (the cost of which, if paid by the producer, is deducted before royalties are calculated). Sometimes further processing is required to remove sulfur and separate gasoline, butane and other constituents from the gas. The royalty, however, remains payable on the value of the gas at the lease or wellhead and the processing costs incurred by the producer downstream of the lease are deducted under the federal rules before calculating royalty, to arrive at essentially a "net" value at the lease.

Coal is a solid mineral of generally uniform quality and composition. In the West, where most federal deposits exist, coal beds often consist of vast deposits of great thickness, in Wyoming averaging 80 feet and up to 200 feet. Little exploration for coal is required, and it is relatively easy to determine the quality of the coal and the thickness of a seam prior to mining with drilling and sampling. The western coal miner thus knows much about the characteristics of the mineral he has to sell prior to actual mining. At the same time, coal mining is an extremely labor and capital-intensive enterprise. Because of the need to construct facilities, obtain equipment, employ workers, and comply with substantial permitting requirements, it can take years to design, permit and construct a mine. For these reasons, coal from federal lands in the West has often been sold under fixed, long-term contracts entered into prior to construction of a mine. Based on the certainty of a market provided by these contracts, the coal miner can lease sufficient reserves to mine over the life of these long-term contracts and make the considerable capital investments required to construct the mine. Additionally, many long term coal contracts and state utility laws allow for the pass through of the royalty burden to the consumer, while no such pass-through is available for many hardrock minerals, which are sold and priced in global markets.

While the 12.5% royalty imposed on coal in 1976 was a considerable increase over the coal royalties typical at the time, the royalty did not take effect for many federal coal leases until they were readjusted, which occurred over a period of 20 years. In the meantime, the demand for low-sulfur western coal boomed due to the increasingly stringent requirements of the Clean Air Act, and transportation costs out of the Powder River Basin decreased, which permitted the large surface coal mines developed in Wyoming during this period to bear the increased royalty burden, which in any event was generally passed on to utilities (and consumers) under long term coal contracts. The higher-cost coal production in Colorado and North Dakota did not fare as well as Wyoming. Colorado's production initially plummeted, and North Dakota's fared little better, and only because North Dakota mines are associated with mine mouth power plants and because the state made efforts to prop up the industry by lowering taxes and discouraging import of coal from Wyoming. The higher BTU or heating value and low sulfur content of Colorado coal has allowed the market to rebound since that time, and to bear the 8% royalty applicable to Colorado's underground coal deposits (although some Colorado mines have operated under royalty reductions during economic downturns).

In addition, the federal coal royalty regulations permit the deduction of the most material processing cost, coal washing, and transportation. Thus, the federal coal royalty is not a gross royalty in the strictest sense, and is more akin to a net or mine mouth royalty on the value of raw ore in a hardrock operation.

Oil and gas and coal are not the only leasable minerals on federal lands. Sodium, potash, and phosphate are also leasable minerals. These minerals are commonly occurring, low margin industrial and fertilizer minerals the economics of which cannot support a 12.5% or even an 8% royalty. The statutorily established base rate for phosphate is 5% and for sodium and potassium is 2%. That is because the nature of these commodities and the economics around their extracting and marketing differ from oil and gas and coal. In practice, these mines have operated under government-sanctioned reduced royalties during periods when economic conditions and foreign competition threatened to close the mines.

These examples demonstrate clearly why prevailing royalties differ from mineral to mineral. Specific analyses can be made for many other types of minerals. It is clear, however, that application of a gross royalty at a rate of 8% to hardrock minerals simply because that is what is done with coal and oil and gas would be overly simplistic and dangerously naive.

Hardrock minerals are, by comparison, scarce and hard to find. Unlike oil and gas and coal, the size and shape of a hard rock ore deposit, the quality of the ore, the mineral composition, the value of the mineral products, the metallurgical processes required, the mining methods, the commodity prices and the capital costs all vary for each operation. Commercial ore bodies may be found under as little as a few acres of land. Exploration is conducted through exploratory drilling which gives initial clues regarding the deposit, followed by many expensive development drill holes to define a deposit for development and expensive feasibility studies of the metallurgical and other processes that will maximize production of the target mineral. Once a prospect is identified, development commences at considerable cost, with the capital and labor intensiveness of large coal mines, but without the geologic or metallurgical certainty of coal mines nor the economic certainty and incentive of long-term coal sales contracts, which are not customary for most hard rock minerals. The prices of hard rock minerals have historically been subject to great fluctuation. Because hardrock deposits were often concentrated by ancient subsurface magma flows which have been altered by subsequent faulting, the concentration of metals and their location can vary considerably over relatively small distances, unlike the relatively constant quality of western coal deposits. As a result, portions of a hardrock deposit may be economic while other portions may contain near- or sub-economic ore that is extremely sensitive to the addition of royalty and other burdens. The combination of price volatility and the variations in the concentration and the chemical and geological characteristics of the minerals within an ore body can turn a profitable mine into valueless rock with a sudden downturn in the market.

Hard rock minerals, therefore, require considerably different approaches to exploration and extraction than do oil and gas and coal. Oil and gas and coal are relatively plentiful, and occur over relatively large areas where found. Hardrock minerals are scarce and occur in small concentrations, and must be discovered by expending considerable money pursuing elusive geological clues. The period between exploration and extraction for hard minerals is much more lengthy than with oil and gas or coal, and since hard minerals prices are not stable, the risk of the project becoming uneconomic before production begins is substantial. These factors are some of the reasons that hard rock mining transactions and agreements are considerably different from each other and from those dealing with oil and gas and coal. These factors also weigh in favor of a royalty reduction provision in the bill, so that site-specific determinations can be made to reduce costs and achieve the maximum economic recovery from federal mineral deposits.

While individual royalties for specific commodities would theoretically be the best approach, such a system might be too difficult to administer. The most reasonable approach given the large number of commodities to be covered would be a uniform net royalty that permits deduction of mining and processing costs. The Nevada net proceeds tax provides a model that has been tested in practice, and you should consider a similar approach for federal lands.

Gross or net smelter return approaches used in private negotiations are inappropriate comparisons

A negotiated royalty between private parties is not analogous to the federal government's imposition of a royalty on millions of acres of unexplored federal lands. Private royalties are negotiated on a case by case basis for each property. Usually, the royalty negotiated depends on what information is known about the property at the time of the negotiation. The less that is known, generally the lower the royalty.

An 8% gross royalty, such as contained in the H.R. 2262, for lands not proven to contain a mineral deposit is unheard of. I am aware of only one royalty of this magnitude in 20 years of practice. At the time Newmont's Gold Quarry royalty was negotiated, there was a known ore body containing eight million ounces of gold on the property, Newmont had existing mine facilities already built on adjacent land, and the owner conveyed the mineral rights to the surrounding area (measuring roughly 25 miles by 15 miles), free from <u>any</u> royalty. That royalty-free land has since proven to contain millions of ounces of additional gold. Clearly, this is not the typical case on unexplored federal land.

Other examples of large "gross royalties" cited by mining opponents (see, for example, Earthworks "Fact Sheet," *H.R. 2262's Royalty: Industry Charges Itself Higher Rates* (10-29-07)) turn out on closer examination not to be gross royalties at all, or are explained by the circumstances of the individual negotiation. They are in no way "typical" private royalties.

For example, the AU Mining Inc. royalty cited by Earthworks was on a small underground mine (producing only 133,000 ounces in the last 10 years) that has average grades of more than 16 ounces per ton of ore, considerably higher than most operations. Moreover, the royalty burden apparently could not be sustained even with these ultra-high grades, forcing AU Mining to give the property back to the owner, LKA International, in a transaction providing for a much lower royalty capped at a maximum of $12 million.

The Barrick Pipeline royalty cited by Earthworks is actually a highly-negotiated series of royalties covering different areas in the mine, consisting of sliding-scale gross smelter return royalties (GSR1 ranging from 0.40% to 5.0% and GSR2 ranging from 0.72% to 9.0%), a 0.71% fixed gross royalty (GSR3), and a 0.39% net value royalty (NVR1). The 9% royalty was granted on lands adjacent to an existing mine, known to contain millions of ounces of gold, in exchange for other royalty interests in an adjacent mine that was going into production at a later date. The Pipeline royalties resulted from an exchange of royalties in proven reserves with determinable values, and are in no way comparable to a royalty negotiated when the mineral value of the property is unknown.

The "gross royalty" paid by High River Gold on its Taparko-Boroum mine in Burkina-Faso is not a royalty at all, but a form of financing known as a "production payment" (an arrangement similar to a loan, with larger repayments of the "principal" in the form of gold at the beginning of the operation, decreasing to a much smaller royalty "tail" after recovery of the principal). The company receiving the royalty provided $35 million to high river gold to construct the mine. High River Gold will repay this with $35 million in gold through a temporary gross smelter royalty, which will then terminate and be replaced by a 2% royalty.

These atypical royalty arrangements in fact prove the point that a royalty on specific mining properties is negotiated based on what is known about the mineral value at the time of the negotiation (unlike the federal royalty, which must be designed to encourage exploration on millions of acres of land with unknown mineral potential). Private royalties are generally negotiated based on existing information about the particular property, including drill hole data and studies or analyses of the target mineral body. The purpose of the federal royalty is to encourage exploration and discovery across millions of acres which are not yet proven to contain mineral deposits.

In privately-negotiated royalties, there are almost as many royalty rates and calculations as there are minerals. Each is dependent upon the nature of the product that is produced and sold, customs and practices in the industry, the strength of the market for the particular mineral, the mining cost/processing cost ratio, the specifics of the property for which the royalty is being negotiated, and many other factors. Use of a net royalty for federal lands avoids the need for extensive, mineral-specific legislation. All mines measure net revenues, or profits, and bear determinable operating costs. Therefore, a reasonable percentage net proceeds royalty can be applied and achieve a reasonable return for the use of federal lands, without disproportionate impacts on any particular mineral industry.

In my experience, other countries are paying considerable attention to the appropriate royalty and tax burden to encourage mineral exploration and development. The United States has relatively low grade deposits of many hardrock minerals, relatively high labor and production costs, and stringent environmental and operating requirements. These costs must also be balanced in determining whether a royalty is necessary on federal lands and if so, how much royalty should be charged. Congress should not impose a royalty without careful consideration of the economic and competitive impacts.

States have not generally adopted gross royalties, and states that have gross royalties use much lower rates than H.R. 2262

Another "fact" cited by opponents of mining is that a "majority" of states have adopted gross royalties. See, for example, Earthworks "White Paper," "A Hardrock Mining Royalty: Case Studies and Industry Norms" (10-2-07). In most cases where "gross royalties" are allegedly imposed by states, the royalty percentage is a fraction of the 8% royalty in H.R. 2262 or the royalty is imposed on ore or an earlier stage product, in some cases after deduction of mining and processing costs. *See, e.g.*, Ariz. Rev. Stat. § 42–5201 – 5202 (2 ½% royalty on 50% of net proceeds); Colo. Rev. Stat. § 39-29-101 *et seq*. (2.25% of gross value of <u>ore</u>, excluding any value added subsequent to mining, subject to an exemption of first $19 million in in come and credits for property taxes paid); Idaho Code § 47–1201 *et seq*. (1% of the gross value of the <u>ore</u>, after deducting costs of mining and processing); Mont. Code Ann. §§ 15-6-131, 15-23-503, (1.6% net smelter return royalty on gold doré and bullion); New Mexico Code, Chapter 7, Art. 26 § 7-26-4 and 7-26-5 (0.5% for copper, 0.2% for gold and silver, and 0.125% for lead, zinc and other metals, on 50% of the value of the minerals). These state royalties are considerably lower than the 8% gross income royalty in H.R. 2262 and in some cases are essentially the equivalent of a net proceeds royalty.

BRITISH COLUMBIA'S FAILED EXPERIMENT WITH A "NET SMELTER RETURNS" ROYALTY IS INSTRUCTIVE

In 1974, British Columbia enacted the Mineral Royalties Act, which imposed royalties on mines located on Crown Lands and the Mineral Land Tax Act and subjected owners of private mineral rights to royalties equivalent to those applied to Crown Lands. The government imposed a net smelter royalty of at 2.5% in 1974, and 5% thereafter.

The results were devastating for British Columbia mineral development. During the period the royalty was in effect, no new mines were developed, several marginal mines ceased operations, and non-fuel mineral output fell, despite increased prices. As a result, revenue collected from royalties on metal mines declined from $28.4 million in 1974 to $15 million in 1975. During the two year period the royalties were in effect, nearly 6,000 mining-related jobs were lost. In 1972, $38 million Canadian was spent on exploration expenditures. In 1975, exploration expenditures fell to $15.3 million Canadian (a 60% decline) while exploration expenditures in the Pacific Northwest -- outside British Columbia --increased. New mine exploration and development spending (excluding coal) decreased from an annual average of $131 million in the years 1970-1973 to an estimated $20 million in 1975 (an 85% decline). In 1972, 78,901 new claims were staked. In 1975 the number of new claims staked fell to 11,791 (an 85% decline).

The royalty was repealed in 1976. After the royalty was repealed, BC Mine Minister Tom Waterland said that "[t]he Government's decision to introduce royalties in 1974 was the result of inadequate understanding of the realities of mineral resource development and the economic characteristic of that development."

I thank the Committee for the opportunity to address this important public lands issue, and I am happy to answer any questions you may have.

EXHIBIT III

James Cress' July 20, 2017 Testimony Before the House Natural Resources Committee/Energy and Natural Resources Subcommittee

Oversight Hearing: "Seeking Innovative Solutions for
The Future of Hardrock Mining"

Subcommittee on Energy and Mineral Resources
Committee on Natural Resources
U.S. House of Representatives

Statement of James F. Cress

July 20, 2017

Mr. Chairman and members of the Subcommittee,

My name is Jim Cress. I am testifying today on the subject of mining royalties at the request of the Subcommittee and not on behalf of any organization. I am a mining lawyer in private practice at Bryan Cave LLP in Denver. With Bryan Cave and a predecessor firm, Holme Roberts & Owen, I have specialized for nearly 30 years in U.S. and international mining law, as well as oil and gas and coal law. I have represented mining companies and landowners in negotiating royalties for gold, silver, copper, iron, zinc, coal, uranium, barite, oil and gas and other minerals, and have advised clients on royalty compliance for private, federal and state royalties and mineral severance taxes. In my international practice, I have evaluated mining royalties and taxes and negotiated royalty and mining agreements with governments in a number of countries. I have also devoted substantial pro bono time to mining issues, particularly in developing countries. I worked on the royalty provisions in the International Bar Association Mining Law Committee's Model Mine Development Agreement, an example template for a mining agreement between a developing country government and mining company. I have supported local and indigenous communities in obtaining more equitable participation in the benefits of mining through the non-profits Sustainable Development Strategies Group and RTC Impact Fund.

Thank you for the opportunity to appear and speak on the important issue of hardrock mining royalties. I have previously testified on this subject before this Subcommittee and before the Senate Energy & Natural Resources Committee, and my comments today will reflect on some of the same issues, which are difficult ones. In particular, if Congress determines that a royalty on locatable hardrock minerals is needed, how can Congress structure a royalty on to promote a fair return to the public, while ensuring a viable domestic mining industry that minimizes reliance on foreign imports of strategically critical minerals?

A. What Does a Royalty Compensate? How Much is Too Much?

The threshold policy question for evaluating a federal hardrock mining royalty is what is the policy reason for compensating the United States with a royalty? Any royalty payment to the United States for hardrock minerals should be based on the value of the United States' ownership interest in the minerals.

That interest is limited to the raw minerals in the ground. The purpose of the federal royalty is to encourage exploration and discovery across millions of acres of federal land which are not yet proven to contain mineral deposits. Compared to oil & gas and coal and similar bedded deposits like sodium and potassium, hardrock deposits are much harder to find and generally require much more extensive mining, processing and refining to produce salable products. A royalty should not be paid on value added to the raw minerals by a mining company spending hundreds of millions of dollars to find, process, refine and sell the mineral products. The United States makes land available for mineral exploration, but the United States contributes nothing to the enormous costs and effort of finding, producing and processing the minerals.

Mining companies pay income and many other taxes in the United States. Any discussion of federal hardrock royalties should focus not only on the amount of the royalty, but on the entire tax and royalty burden applicable to mining. Mining companies take the same holistic view of the cost of doing business when they are deciding whether to invest their exploration and mine development capital in the U.S. or another country.

The total "government take" (royalties, taxes and other fees) for mining operations in the United States is already comfortably within the range of other competitive mining countries. Professor James Otto and others have conducted various studies comparing government take from mining in various countries, which included the states of Arizona and Nevada (two of the highest mineral producing western states with substantial federal lands). The most recent public study was published in 2000. Otto, Batarseh & Cordes, "*Global Mining Taxation Comparative Study (Second Edition)*" (Institute for Global Resources Policy & Management Mar. 2000) ("Global Mining Taxation"). The study evaluated all of the direct and indirect taxes on mining (including royalties) in 24 countries, including a range of developed and developing countries. The authors then modeled the impact of "government take" in these countries on two hypothetical mineral deposits, a gold mine and a copper mine, to evaluate and compare the burden imposed by these tax and royalty regimes.

Professor Otto testified in 2008 before the Senate Energy and Natural Resources Committee that his studies have shown that many mineral producing countries impose a total effective tax rate (government take) in the range of 40 to 50%. In the Global Mining Taxation study, the effective tax rate in 2000 for Nevada was <u>49.3</u>% for a medium-profitable gold mine, without the imposition of any federal royalty. See Global Mining Taxation, Section 4.5, pp. 95-96 and Table 27. With a 10% drop in the gold price from the 2000 price, Nevada's effective tax rate jumped to a confiscatory <u>63</u>%. Id. p. 101 and Table 28. Similarly, the effective tax rate in 2000 for the hypothetical copper mine in Arizona was <u>49.9</u>%, without the imposition of any federal royalty. Id. Section 4.5, pp. 95-96 and Table 27. These studies suggest that even a small federal royalty could take the United States out of the 40-50% effective tax rate range typical for successful mineral producing countries, making the U.S. less competitive for mining investment.

It would be prudent to update these studies in designing any federal royalty, so the impacts can be modeled and understood. Significantly, as discussed below, almost all of the western states already impose a severance or extraction tax on mining from private, state and federal lands. Any federal royalty will have to be added on top of these existing burdens, making it crucial that the royalty not be so high that the combined burden makes future mining uneconomic, negatively impacting state tax revenues and driving mining activity off of federal lands.

B. Form of a hardrock royalty - gross versus net royalties and royalty rates

There are many types of royalties used in the mining industry and by governments around the world, from simple unit-based royalties (a fixed amount per ton produced) to royalties based on net proceeds or net profits after deduction of mining and/or processing costs, to gross royalties with little or no deductions. The latter two types, often referred to loosely as "net" and "gross" royalties, are most often proposed for a potential federal hardrock royalty.

There are two issues to consider when evaluating net and gross royalties - the royalty rate and the calculation of the amount against which that rate is applied (also called the "royalty base"). Differences in the royalty base are what we are discussing when talking about "net" versus "gross" royalties. It is important to look closely at the definition of the royalty base when comparing private royalties to government royalties or comparing royalties of different countries or U.S. states, since what may be called a "gross" royalty may actually be based on the "gross value of ore," rather than a final mineral product, the "gross value less processing costs," "gross value at the mine mouth" or another royalty base definition that is functionally equivalent to a net royalty base. "[T]he definition of the royalty base is critical to understanding the rate. When comparing royalty rates in different jurisdictions, care must be taken not to compare rates unless the royalty base is identical." Otto, et al., "Mining Royalties: A Global Study of Their Impact on Investors, Government, and Civil Society" p. 62 (World Bank 2006)("World Bank Study*").*

Net royalties and gross royalties have differing impacts on mining investment due to the cyclical nature of commodity price cycles. Generally, a royalty assessed on gross income increases the economic risk of a given mining investment, and acts as a disincentive to investment. As a consequence, a company looking to develop a project will require a higher required pretax and after-tax rate of return to accommodate the increased risk. Because a royalty assessed on net income has a smaller effect on the variability of after-tax rates of return, it is a better basis for assessing a royalty. As commodity prices decrease, the rate of return required to justify a mining investment increases more dramatically under a gross royalty than under a net royalty. Because the other costs of the mining operation are relatively fixed, the gross royalty takes a bigger bite out of the shrinking income pie as prices decrease. This can have a dramatic impact on whether existing mines stay open or new mines are built.

Because the royalty assessed on gross income will cause a larger reduction in after-tax income when profits are low (or negative) than a royalty assessed on net income, the royalty on

A gross royalty can exacerbate industry downturns by causing a greater reduction in the cash flows of mining companies when profits are already low. A gross royalty may actually reduce the volume of an ore deposit that can be recovered. Each deposit of metallic minerals will have varying grades of mineral, generally requiring extensive concentration and refining to be marketable. The portion of the deposit with grades too low to be recovered economically is either removed as waste or left undisturbed in the ground. A gross royalty raises the "cutoff point" between recoverable ore and waste, and may shorten the life of a mine by causing what otherwise would be valuable minerals below the cutoff point to be lost. These lost reserves generally can never be recovered, because once a mine is closed and reclaimed, the stranded reserves are usually uneconomic to recover on their own in the future. When mines shut down prematurely, in addition to lost mineral reserves, jobs are lost, federal state and local tax revenues are lost, and business is lost by suppliers of other goods and services that the support the mines. These lost economic benefits affect both those directly involved in the mining activity and the governmental entities, including the United States, and their citizens who rely on taxes paid by mining operations.

A net proceeds or net income royalty, in contrast, does not cause a mining operation to operate at a loss. A net royalty automatically reduces during periods of low prices and increases again when prices are higher, permitting mining operations to weather periods of low commodity prices and maximize the recovery of marginal ore during periods of high prices. Due to the cyclical nature of demand for mineral commodities, there have been and will always be periods of lower commodity prices. A net royalty provides the best incentive to explore for minerals on federal lands throughout economic cycles and keep the domestic industry viable and the nation's mineral supply secure.

Determining what rate is appropriate to apply across dozens of commodities and millions of acres of federal land with differing mineral potential should not be a matter of opinion or guesswork. Congress should look closely at the type and rate of hardrock mineral royalty that has worked in states and countries that have maintained vibrant mining industries.

C. Hardrock minerals are different, and should be treated differently than coal and oil and gas

Why should hardrock minerals not be subject to the 8 percent or greater royalty imposed on oil & gas and coal? The dramatically different characteristics of the minerals themselves and the ways in which they are explored for and developed justifies different royalty treatment. The royalty on oil produced under federal leases is not based upon the value of these refined products, however; it is measured by the value of the crude oil at the lease or wellhead, prior to such processing and refining. Unlike most hardrock minerals, there is a market for oil in its crude, unrefined state and therefore a ready value for royalty purposes before the value added by refining and processing. Most oil is sold at the wellhead into this crude oil market and that wellhead sales price establishes the value of the oil for federal royalty purposes. Thus, it is somewhat misleading to call the federal royalty on crude oil a "gross" royalty, because the royalty is "net" of refining costs, equivalent to a net or mine mouth royalty on the value of raw ore in a hardrock operation.

Similarly, federal royalty on gas is also based upon the value of the gas at the lease. After gas is extracted, often the only thing required for consumption by the ultimate end-user is transportation (the cost of which, if paid by the producer, is deducted before royalties are calculated). Sometimes further processing is required to remove sulfur and separate gasoline, butane and other constituents from the gas. The royalty, however, remains payable on the value of the gas at the lease or wellhead and the processing costs incurred by the producer downstream of the lease are deducted under the federal rules before calculating royalty, to arrive at essentially a "net" value at the lease.

Coal is a solid mineral of generally uniform quality and composition that requires little or no processing. In the West, where most federal deposits exist, coal beds are vast, world-class deposits of great thickness, in Wyoming averaging 80 feet and up to 200 feet. Little exploration for coal is required, and it is relatively easy to determine the quality of the coal and the thickness of a seam prior to mining with drilling and sampling. While the 12.5% royalty for surface mined coal (8% for underground) imposed in 1976 was a substantial increase over coal royalties typical at the time, the royalty did not take effect for many federal coal leases until they were readjusted, which occurred over a period of 20 years. In addition, the federal coal royalty regulations permit the deduction of the most material post-mining costs, coal washing (where needed) and transportation. Thus, the federal coal royalty is not a gross royalty in the strictest sense, and like oil and gas, is more akin to a net or mine mouth royalty on the value of raw ore in a hardrock operation.

Oil and gas and coal are not the only leasable minerals on federal lands. Sodium, potash, and phosphate are leasable minerals that are low margin industrial and fertilizer minerals, the economics of which cannot support a 12.5% or even an 8% royalty. The statutorily established base rate for phosphate is 5% and for sodium and potassium is 2%. That is because the nature of these commodities and the economics around their extracting and marketing differ from oil and gas and coal. In practice, these mines have operated under government-sanctioned reduced royalties during periods when economic conditions and foreign competition threatened to close the mines.

These examples demonstrate clearly why prevailing royalties differ from mineral to mineral. Specific analyses can be made for many other types of minerals. It is clear, however, that application of a gross royalty at a rate of 8%

to hardrock minerals simply because that is what is done with coal and oil and gas would be overly simplistic and dangerously naive.

D. State Royalties and Severance Taxes are Generally Net Royalties or Small Gross Royalties

Western states, in which most federal lands are located that would be subject to a federal hardrock royalty, tend to impose two types of burdens on hardrock mining - royalties on mineral production from state lands and severance taxes on private, state and federal mineral production. Both are calculated using a percentage of the value of the mineral produced, so both can be useful as comparisons for a federal royalty.

The approaches of the western states to royalties and severance taxes, including the use of net or gross, vary considerably (with more than one approach sometimes used in the same state), but most states include a net approach or an approach based on the gross value of ore or mine mouth value, which is equivalent to a net. State royalties and severance taxes were summarized by the General Accounting Office in a 2008 study. *See* "Hardrock Mining: Information on State Royalties and Trends in Mineral Imports and Exports," GAO-08-849R (GAO July 2008)(2008 GAO Report).

Western states apparently do not perceive that net approaches impose undue burdens on the state in calculating and collecting royalties and severance taxes. No state imposes a flat royalty on gross income without any deductions like the royalty often proposed in prior mining law and budget bills. In addition to their varied approaches to the royalty or severance tax base, the states all impose significantly lower royalty or severance tax rates than the 8% gross royalty that has often been proposed in prior mining law and budget bills. Rates in the western states tend to be lower for gold, copper and other metals.

The various western state approaches to royalty and severance tax base are discussed below in a continuum from the most "net" to the most "gross" approaches. This summary is based on the 2008 GAO Report, the most recent survey of state royalty and severance tax laws, and has not been updated, but the variety of state approaches have not differed materially since its publication.

1. Net Profits or Net Proceeds

A number of states define the royalty base or severance tax base on a net profits or net proceeds basis. These state burdens are truly "net," in the sense that the royalty base is typically determined after deduction of all mining and processing costs and transportation.

Alaska imposes a royalty of three percent of net income on mining from state lands. Alaska Stat. § 38.05.212. Alaska also imposes an additional mining license tax (similar to a severance tax) that is calculated as a percentage (between three and seven percent) of the net income from the property.

Producing mines are exempted from the tax for three and a half years, in order to allow them first to recover their capital costs. Alaska Stat. Tit. 43, Ch. 65..

Nevada imposes a severance tax of between 2 and 5 percent of net proceeds. Nev. Rev. Stat. Ann. Ch. 362.. "Net proceeds" is defined as the gross value of the mineral product, less deductions for extraction costs, processing, refining and sale costs, costs of transportation from the mine to the place of processing and sale, marketing costs, maintenance and repair costs for machinery, facilities and equipment used in mining, processing and transportation, depreciation of such facilities and equipment, insurance costs, costs of employee benefits, development costs, royalties, and certain administrative overhead costs. *Id. §* 362.120; Nev. Admin. Code Ch. 362. This tax is phased in as the percentage of net proceeds to gross proceeds increases, with the lower rate applying to operations generating $4 million or less in annual net proceeds.

California imposes a royalty on state lands on a lease-by-lease basis. One basis used is a percentage of the net profits derived from mineral extraction operations. *See* Cal. Pub. Resources Code § 6895.

Montana taxes the net proceeds of minerals other than coal, bentonite and metal mines (metal mines are taxed on a net smelter returns basis as described below). Mont. Code Ann. § 15-6-131(1), (2). Id. § 15-23-503. The "net proceeds" tax base is defined as gross receipts received from the sale of concentrates or metals, less allowable deductions. Deductions allowed include royalties paid, costs of labor, machinery and supplies used in mining operations and development, costs of improvements, repairs or replacements to the mine, mill or reduction works, and depreciation of the mill and reduction works, transportation from mine to mill or place of sale, marketing costs, insurance, environmental, reclamation and mine safety compliance costs, sampling and assaying charges, engineering and geological service charges.

"Net profits" are defined as gross receipts from the sale of precious metals, less deductions for the cost of extraction, transportation from mine to mill, the costs of reduction, refining and sale, marketing costs, costs of maintenance and repairs of mining, processing and transportation machinery, equipment and facilities and administrative facilities, interest costs, insurance costs, employee benefits, depreciation of machinery, equipment and facilities, mine exploration and development costs, reclamation costs, royalty payments, state and local taxes, and general administrative expenses incurred within the state. *Id. §§* 10-39-44, 10-39-45.2.

Arizona also had a royalty on state land of five percent of the net value of minerals, until a 1989 state supreme court decision overturned this method as being inconsistent with the State's enabling act (a rationale that would not apply to a federal royalty). Ariz. Rev. Stat. § 27-234 (repealed); see *Kadish v. Arizona State Land Department,* 155 Ariz. 484; 747 P.2d 1183 (1987).

2. Gross Value of Ore or Mine Mouth Value

A number of western states have imposed royalties or severance taxes that are based on the gross value of the unprocessed ore or mine mouth value. This is the functional equivalent of a net proceeds or net profits approach, with deductions for all processing and transportation costs and, in some states, mining costs.

Colorado's severance tax is 2.25% of the gross value of the ore, excluding any value added subsequent to mining, and subject to an exclusion for the first $19 million in income and credits for property taxes and any state land royalties. Colo. Rev. Stat. §§ 3929-102 to -104. Colorado state land royalties are determined on a case by case basis, *see* Colo. Rev. Stat. §36-1-113 , but gross value of ore has been used for some minerals, and net smelter returns for others. *See* "Royalties in the Western States and in Major Mineral-Producing Countries," GAO/RCED-93-109, p.28 (GAO 1993*)*("1993 GAO Report")*.*

Idaho imposes a license tax (equivalent to a severance tax) of 1% of the gross value of ore, after deducting all costs of mining and processing the ore. Idaho Code §§ 47-1201, 47-1202. Idaho, like Colorado, imposes state land royalties on a case by case basis in each lease, *see* Idaho Code § 47-710 , and has in the past also used a royalty of between 2.5% (for certain metals) to 10% (for certain non-metallic minerals) of the value of the unprocessed ore. *See 1993 GAO Report,* p.30.

Utah has imposed a royalty on minerals extracted from state lands of a specified percentage of the value of the minerals, including a royalty of 4% of the gross value of the ore sold for metals other than uranium. *See 1993 GAO Report,* p.43.

South Dakota imposes a royalty on leases of state lands of not less than 2% of the gross returns from the sale of ores and mineral products derived therefrom, less smelting and reduction charges and transportation and any other "customary and appropriate charges" determined by the state land commissioner. S.D. Cod. Laws § 5-7-55. If the ore is sold, this constitutes a royalty on the "gross value of ore" without a deduction for mining costs.

Wyoming's severance tax is based on the fair market value of the minerals at the mouth of the mine, after extraction. Wyo. Stat. § 39-14-703. This royalty base is also equivalent to the value of ore, like the states above, but without a deduction for mining costs.

Montana imposes a royalty on state lands of at least 5% of the market value of the minerals recovered. Mont. Code Ann. § 77-3-116. Montana has in the past defined this royalty as a percentage of the value of the raw minerals recovered from the claim, *See* 1993 GAO Report, p. 32; 2008 GAO Report*,* p.18-19, which is similar to the "gross value of ore" used in the states described above.

Oregon imposes a royalty of 5% on most metallic minerals removed from leases of state lands. Or. Admin. R. §§ 141-071-0410, -0610. The royalty base is calculated on the gross value of minerals at the mine mouth. *Id. §* 141-071-0620; *See 2008 GAO Report,* p.25.

3. Net Smelter Return and Similar Approaches

Several states employ net smelter return or similar methodologies in their royalties or severance taxes. Net smelter return approaches are more common in state land royalties, which may be in part because of the trust requirements imposed by state enabling statutes on state lands, as discussed above.

Montana imposes a license tax (similar to a severance tax) on metal mines of 1.6% of the net smelter returns for precious and base metals. The tax is 1.8% on mineral concentrates prior to shipment to the smelter. Mont. Code Ann. §§ 15-23-801, 15-37-102, 15-37-103. The tax base is the receipts received from the sale of concentrates or metals, less allowable deductions. Deductions allowable in calculating the tax include treatment and refinery charges, costs of transportation from the mine or mill to the smelter, roaster or other processing facility, quantity, price, impurity and penalty charges, and interest. *Id. §* 15-23-801(5). Treatment and refinery charges include labor cost, utility and fuel costs, costs of maintenance, repairs and supplies, materials, depreciation, rental of equipment, pollution control costs, costs of training, freight, engineering, insurance and licensing attributable to smelting and refining, administrative services and all third party treatment and processing costs. *Id.* § 15-23-801(2).

New Mexico imposes a royalty on state lands of not less than 2% of the gross returns from the smelter or other processing facility, less the costs of smelting or reduction and transportation. N.M. Stat. Ann. § 19-8-22. This is functionally a net smelter returns royalty. The royalty percentage is not less than 5% for uranium and certain other minerals.

South Dakota imposes a royalty on leases of state lands of not less than 2% of the gross returns from the sale of ores and mineral products derived therefrom, less smelting and reduction charges and transportation, and any other "customary and appropriate charges" determined by the state land commissioner. S.D. Cod. Laws § 5-7-55. If concentrates or metals are sold and no other deductions are allowed by the commissioner, this is equivalent to a net smelter return.

As an alternative to the net profits royalty base described above, **California** may impose on a case-by-case basis a royalty on state lands based on 10% of the gross value of the mineral production less processing and transportation charges, which is similar to a net smelter return calculation. *See* Cal. Pub. Resources Code § 6895.

4. Gross with Flat Cost Deduction

Two states use an innovative "gross with flat cost deduction" severance tax system. This approach attempts to approximate the economic burden of a net profits or net proceeds tax, while minimizing the administrative burden by eliminating the need to audit mine-specific cost deductions, by allowing a flat deduction of a percentage of gross proceeds to approximate the deduction of mining and processing costs. These states apply different tax rates to different minerals, and permit different flat cost deductions for different types of mineral products. This is not a "net" approach, however, because the flat cost deduction treats all mining operations the same regardless of their actual costs; this system is effectively a small gross burden that varies for different minerals. The administrative simplicity of the flat deduction has been somewhat offset by the need to amend the statute more frequently to ensure that the size of the flat cost deduction reflects actual costs to the extent possible, and to address concerns of particular mineral producers with higher processing costs, such as beryllium miners in Utah.

New Mexico imposes a severance tax of between 1/8 and 1/2 of 1% (depending on the metal or mineral) of the "taxable value" Taxable value is the value of a specific mineral product (concentrates for molybdenum, copper, lead and zinc, concentrate or dore for gold) less 50% to 66-2/3% of that value to approximate the costs of mining and processing. The tax rate and cost deductions differ for various minerals.

Utah's severance tax is 2.6% of the "taxable value," which is determined based on the product sold. If the mineral product sold is ore, the taxable value is 80% of the gross proceeds, with the 20% of the value excluded approximating a deduction for mining and transportation costs. If the product sold is metal (other than beryllium), the taxable value is 30% of the gross proceeds, with the remaining 70% of gross proceeds approximating a deduction for mining, processing and transportation costs. Beryllium formerly had a taxable value of 20% of the gross proceeds, with an 80% deduction for costs, but taxable value is now equal to 125% of the mining costs. For intermediate mineral products such as copper concentrate, the taxable value is based on the amount of contained metal in the product if the intermediate product is further processed rather than being sold at the point of taxation.

5. Gross Receipts from First Marketable Product

Washington imposes a royalty on minerals extracted from state lands of 5% of the gross receipts. "Gross receipts" are based on the value of the first marketable product, subject to the deduction of transportation costs. Wash. Admin. Code §§ 332-16-035, 332-16-155. This royalty appears to be either a gross or net burden depending on the mineral product sold, whether ore, concentrates or finished metals. Washington has no severance tax, which may help offset the impact of this potentially more gross royalty calculation.

6. Unit-based Severance Taxes on specific minerals

Several states impose an additional, unit based severance tax on particular minerals. A unit-based tax is not based on a percentage of the value of the mineral, such as the net and gross ad valorum approaches described above, but is a flat dollar amount per unit of mineral produced. These taxes tend to be aimed at large producers or particular minerals in these states, presumably because the states have determined they are able to bear a higher tax burden. Unit-based royalties are not a good basis for designing a federal royalty, which must apply to many commodities and many types of mining operations.

Colorado imposes an additional severance tax of five cents per ton of molybdenum ore for all tons over 625,000 produced in a calendar quarter. The quantity limitation limits the tax primarily to two of the largest molybdenum mines in the world that have operated in Colorado for decades.

South Dakota imposes a severance tax on gold of $4 per ounce, plus an additional $1 to $4 dollars per ounce depending on the gold price. *Id.* § 10-39-43.

E. Any hardrock royalty legislation should allow for royalty reductions and waivers on a case by case basis

All current federal royalty statutes for oil and gas, coal and other minerals permit the Department of the Interior to grant royalty waivers and reductions on a case by case basis. The same flexibility should be provided in any hardrock mining statute. In order to avoid administrative complexity, any hardrock royalty will probably have to be applied in a fairly uniform manner across a large number of commodities and mining and processing methods. Any inequities created by this broad brush approach can be partially addressed by providing a mechanism for specific operations or mineral commodities to apply for royalty relief, in order to address economic hardships or to maximize the economic recovery of minerals from each deposit.

F. Any Royalty Should Not Apply to Existing Valid Mining Claims

A grandfathering of at least some existing unpatented mining claims from the new royalty is both required by law and required to treat fairly parties that have made significant investments in federal lands prior to the enactment of the royalty. Moreover, it may be advisable to grandfather some claims that may not constitute fully vested property rights, in order to have a simple, bright-line test for which claims are subject to the new royalty, which will reduce uncertainty, reduce administration and litigation costs for the government and promote mining investment.

It is settled law that unpatented mining claims supported by a "discovery" of a "valuable mineral deposit" create Constitutionally-protected property rights in the owner of the claim. Imposition of a royalty on such claims is likely to trigger significant "takings" litigation against the government. A royalty is in no way comparable to the imposition of simple federal filing requirements on unpatented mining claims, which was upheld by the Supreme Court in United States v. Locke, 471 U.S. 84 (1985). Grandfathering claims with a valid discovery as of the date of enactment from the royalty is thus the minimum transition approach that is legally defensible, as Professor John Leshy agreed in his prior testimony before the Senate Environment and Natural Resources Committee.

The problem with protecting only claims with a valid discovery is that determining which of the hundreds of thousands of mining claims has a discovery would be an unprecedented administrative challenge for the Department of the Interior. Under a long line of court cases and administrative decisions, a mining claim does not have to be currently producing to support a "discovery"; a reasonable prospect that the claim could be profitably mined is sufficient. Currently, the Department requires an administrative hearing in order to contest claims for lack of a discovery. Due process requires a hearing for claimants on this issue. The Department has only a handful of hearing examiners trained in the specialized rules applicable to determining whether a "discovery" exists. It would be unworkable for the Department to adjudicate hundreds or thousands of these mining claim validity cases to determine which claims can be legally subjected to a new federal royalty.

To avoid the royalty transition becoming an administrative gridlock, Congress should apply the royalty only to claims located after the enactment of the law or to claims that are not included in a plan of operations approved by the Department prior to the date of enactment (without a requirement for commencement of commercial production). Having a "bright line" test will save administrative costs and will also promote certainty about the application of the new royalty, which will encourage investment.

Conclusion

In my experience, other countries are paying considerable attention to the appropriate royalty and tax burden to encourage mineral exploration and development. The United States has relatively low grade deposits of many hardrock minerals, relatively high labor and production costs, and appropriately stringent environmental and operating requirements. These costs must also be balanced in determining whether a royalty is necessary on federal lands and if so, how much royalty should be charged. Congress should not impose a royalty without careful consideration of the economic and competitive impacts.

I thank the Committee for the opportunity to address this important public lands issue, and I am happy to answer any questions you may have.