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FEDERAL ELECTRIC VEHICLE INCENTIVES INCLUDING THE FEDERAL GOVERNMENT'S ROLE IN FOSTERING RELIABLE AND RESILIENT ELECTRIC VEHICLE SUPPLY CHAINS

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED EIGHTEENTH CONGRESS

SECOND SESSION

JANUARY 11, 2024

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CONTENTS

OPENING STATEMENTS

	Page
Manchin III, Hon. Joe, Chairman and a U.S. Senator from West Virginia	1
Barrasso, Hon. John, Ranking Member and a U.S. Senator from Wyoming	8
Wyden, Hon. Ron, a U.S. Senator from Oregon	13

WITNESSES

Turk, Hon. David M., Deputy Secretary, U.S. Department of Energy	15
Adeyemo, Hon. Adewale O., Deputy Secretary, U.S. Department of the Treasury	28

ALPHABETICAL LISTING AND APPENDIX MATERIAL SUBMITTED

Adeyemo, Hon. Adewale O.:	
Opening Statement	28
Written Testimony	30
Responses to Questions for the Record	96
Barrasso, Hon. John:	
Opening Statement	8
Bloomberg article entitled "Hertz to Sell 20,000 EVs in Shift Back to Gas-Powered Cars" by David Welch and Richard Clough, published January 11, 2024	10
Better Business Bureau profile of Sunnova Energy Corporation	37
Bryce, Robert:	
Statement for the Record	110
Cortez Masto, Hon. Catherine:	
Chart entitled "Building America's Clean Energy Future"	74
GreenMet:	
Statement for the Record	123
Heinrich, Hon. Martin:	
Forbes article entitled "In 2023, The United States Started Building Big Again, Thanks to Biden's Inflation Reduction Act" by Jack Conness, published December 26, 2023	40
Axios article entitled "A Manufacturing Investment Supercycle Is Starting" by Neil Irwin, published June 16, 2023	47
Chart entitled "211,350 Clean Energy Jobs Since Passage of the Bipartisan Infrastructure Law and Inflation Reduction Act"	52
Chart entitled "Building America's Clean Energy Future"	53
Hoekstra, Peter and Joseph J. Cella:	
Statement for the Record	125
Institute for Energy Research:	
Statement for the Record	130
Report entitled "The Economic and Strategic Importance of Domestic Mineral Production: Unlocking the Value of America's Homegrown Mineral Resources"	134
King, Jr., Hon. Angus S.:	
Chart comparing cost of ownership of electric vehicles versus gas-powered vehicles	62
Chart entitled "The Inflation Reduction Act Is Accelerating U.S. Battery Manufacturing"	64

Page

Manchin III, Hon. Joe:
Opening Statement 1
Chart depicting Inflation Reduction Act critical mineral sourcing percentage requirements 4
Chart depicting Inflation Reduction Act deadlines for removing China from vehicle supply chains 6
National Mining Association:
Statement for the Record 171
Nunes, Ashley:
Letter for the Record 107
Turk, Hon. David M.:
Opening Statement 15
Written Testimony 17
Responses to Questions for the Record 82
Wyden, Hon. Ron:
Opening Statement 13
Zero Emission Transportation Association:
Statement for the Record 185

FEDERAL ELECTRIC VEHICLE INCENTIVES INCLUDING THE FEDERAL GOVERNMENT'S ROLE IN FOSTERING RELIABLE AND RESILIENT ELECTRIC VEHICLE SUPPLY CHAINS

THURSDAY, JANUARY 11, 2024

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The Committee met, pursuant to notice, at 10:00 a.m., in Room SD–366, Dirksen Senate Office Building, Hon. Joe Manchin III, Chairman of the Committee, presiding.

OPENING STATEMENT OF HON. JOE MANCHIN III, U.S. SENATOR FROM WEST VIRGINIA

The CHAIRMAN. The Committee will come to order.

First, we want to thank all of you for being here. We want to thank David for coming, David Turk, from DOE, and we have Adewale Adeyemo, he will be with us virtually. Unfortunately, he has COVID, but he is still able to participate and we really appreciate his efforts of doing that. It is going to be very helpful for all of us.

We are here to talk about a familiar subject to members on this Committee—the electric vehicle supply chain. Before we begin, I want to start, again, by thanking all of those who are participating, all of those who made this possible. I appreciate—Adewale, again, I hope you are feeling better and that you are back in operation soon. I know you and David Turk have important responsibilities implementing the laws passed by Congress to secure the EV supply chain.

We should all be concerned when an Administration tries to implement a law that Congress did not pass. And when it comes to EVs, this Administration is implementing the Build Back Better approach they wanted, not the Inflation Reduction Act that we passed. The Inflation Reduction Act had three purposes—reduce our debt, secure our energy and produce it cleaner in America than anywhere else, and bring back manufacturing of the building blocks that run our country and made us the superpower of the world. Some may believe I just have a vendetta, which I don't, against EVs. I don't own an EV. I don't intend on buying an EV. But I think they are a wonderful vehicle. I just think that we got way ahead of our skis on this.

The transportation sector is responsible for 29 percent of the greenhouse gas emissions in the country, more than any other sec-

tor, with light duty vehicles making up 58 percent of those emissions. Globally, transportation makes up about 15 percent of total greenhouse gas emissions. Alternative-fueled vehicle technologies, like EVs, hydrogen vehicles, and hybrids, can play an important role in lowering these emissions while providing an opportunity for the United States to maintain our status as an automotive powerhouse, which we have always been; re-shore our manufacturing base, which we have let go; and create good-paying jobs, which we all need. My problem is not with EVs. My problem is with the Administration's crusade to convert everyone over to an EV regardless of where the battery came from or what the law actually says. The United States is the birthplace of Henry Ford, and the revolutionary Model T. Vehicle manufacturing is a building block of our great nation. There has never been a time when we couldn't produce the engines, transmissions, axles, and every other essential component of a car. I remember waiting in line for gas in the 1970s to go to work because of OPEC. And I will be damned if I am going to have to wait for a battery from China.

Just like how Putin weaponized Russia's oil and gas resources to try to scare off Europe from supporting Ukraine, Xi Jinping and the Chinese Communist Party are more than willing to use EV batteries and the critical minerals inside them as leverage to put Americans and the free world at risk. China has already started to do so with recently announced export controls of certain critical minerals. China has truly cornered the market on EVs and is responsible for 74 percent of the world's cathode production, 92 percent of the anode production—that's the positive and negative of a battery—and 76 percent of the lithium-ion battery production. They control anywhere from 60 to 100 percent of minerals processing, depending on the mineral. But it doesn't have to be that way. America and free trade agreement partners have the capacity to produce this for ourselves. For example, our free trade agreement partners, combined, are mining more lithium, nickel, and cobalt than China, and 20 to 40 percent of the global processing capacity for these minerals belong to either a U.S. ally, one of our FTA partners, or exist in our own country, and that is before we develop the mining and processing facilities in the queue. Figures like these show why correct implementation of the Inflation Reduction Act and the Bipartisan Infrastructure Law is so vital coupled with comprehensive and common-sense permitting reform. These bills were carefully designed to help us win back our vehicle supply chains, and create new domestic jobs. Unfortunately, it seems that the Administration is so hell-bent on implementing their radical climate agenda—quicker than needed—for political gain that they are willing to bend and break the law and watch our manufacturing base continue to fall behind.

What I'm saying here is nothing I haven't said to the President. I think we have a respectful disagreement on how it is being implemented. We should all be proud of the bill that we have, it is most transformative. The IRA is the most transformative bill that we have ever done in my lifetime. Let me give you some examples: First, in proposed guidance, the Administration has cut the IRA critical mineral sourcing percentage requirements in half, which is a blatant violation of the numbers Congress wrote directly into the

law. These were written into the law. That is in the bill. This is what they are operating on, half of that. They are operating on half of it, but we should be expediting all of our efforts in trying to make sure that we hit these numbers versus receding back to their numbers and depending on foreign supply chains.

[Displayed chart follows:]

The IRA included **strong sourcing requirements** for the extraction and processing of critical minerals to qualify for half of the consumer Clean Vehicle Tax Credit

	% of minerals that must be extracted or processed in the U.S. or Free Trade Agreement countries, or recycled in North America according to the IRA	% of minerals that must be extracted or processed in the U.S. or Free Trade Agreement countries, or recycled in North America according to Treasury's proposed rules
2023	40%	20%
2024	50%	25%
2025	60%*	30%*
2026	70%*	35%*
2027	80%*	40%*
2028	80%*	40%*
2029	80%*	40%*
2030	80%*	40%*
2031	80%*	40%*

These percentages have effectively been **cut in half** by the "50% of value-added test" included in Treasury's proposed rules

*Minerals from Foreign Entity of Concern are not permitted

ENERGY & NATURAL RESOURCES Democrats

The CHAIRMAN. They are also pretending the battery component manufacturing is the same as critical mineral processing. Extraction and processing is different than manufacturing, and it is stated in the bill—manufacturing has to be done in North America to get the $3,750. They are proposing fake "critical minerals free trade agreements," such as with Indonesia. Indonesia is controlled by China. You can't make that up. You can't think that Indonesia is going to be a free trade agreement country. They don't have control of it. These are the things that we are talking about. And we are hoping that we will all come back to our senses, Democrats and Republicans, working together on this to get back to what the bill was intended to do.

And, most recently, with their proposed rules on Foreign Entities of Concern, the Administration is delaying the deadlines we wrote into the IRA to remove China completely from the battery supply chain. If we don't do it sooner than later, it's going to be something we will be dependent on for a long time. As shown in the chart behind me, under the weakened Foreign Entity of Concern rules, vehicles that contain battery minerals and components from China and other adversaries can qualify for years longer than allowed in the bill.

[The chart referred to follows:]

The IRA included **firm deadlines** for removing China from vehicle supply chains in order to qualify for the consumer Clean Vehicle Tax Credit

	Deadline in *Inflation Reduction Act*	**Deadline in Proposed Treasury Rules**
No Extraction or Processing of Critical Minerals by Chinese Entities, or Other Foreign Entities of Concern	December 31, 2024	December 31, 2026, or Later
No Battery Manufacturing by Chinese Entities, or Other Foreign Entities of Concern	December 31, 2023	December 31, 2026, or Later for Certain Anode and Cathode Components

The IRA prohibitions on Chinese supply chain have been **delayed at least two years** by Treasury's proposed rules

ENERGY & NATURAL RESOURCES
Democrats

The CHAIRMAN. This is in the bill: 2024, deadline from the Inflation Reduction Act—no extraction or processing of critical minerals by Chinese entities or other foreign entities of concern, December 31, 2024. They now have written into their proposed rules, December 31, 2026, or later. This says no battery manufacturing by Chinese entities or foreign entities of concern. That was supposed to be December 31, 2023, which gave them a year. Now they are 2026 or later for certain anode and cathode components. Who knows? That's all temporary rules. You cannot operate that long on temporary rules because they weren't designed for that.

The Biden Administration did not write the bill, and quite frankly, it seems like some of the people implementing the law have not really read it or don't understand what our intentions were. The tax code Congress writes is not a set of voluntary guidelines, but that happens to be how some in the Administration are treating it, and the EV credit is just one of several concerning examples. If the Administration does not correct course and implement the IRA programs the way that we wrote them, their unlawful rules are bound to get struck down in court, which will create tremendous uncertainty for both automakers and consumers, and for all the investments that are coming to all of our states. Every one of us are benefiting from this bill. I will support any entity that goes to court to correct the illegal liberalization of this law with an amicus brief to set the record straight on the bill Congress actually wrote. It won't be hard to support it because it is just as plain as you can read it, it's in the bill. I am willing to go and do whatever it takes to make sure that we get back on track.

Now, let me be clear, just because the Administration has broken a lot of the laws implementing certain aspects of the IRA, it does not change how proud that we all should be of the law that we actually passed. There is no question the IRA is doing what we hoped it would do in many respects. And it will do so much more if this Administration follows the law of the land. The IRA raised $687 billion in revenue, invested $384 billion in energy security while also improving our environment, invested another $64 billion in health care, and with the balance, we paid down $239 billion of debt. These are things that you never hear anybody talk about. Today, we are producing more energy than ever before in America. You don't hear anybody bragging about that. We have been more independent today than we ever have been in the history of the United States. Thirty-seven trillion cubic feet of natural gas, 4.7 billion barrels of oil, record amounts of solar power and battery storage, and we are continuing to innovate to make our energy even cleaner. We are transitioning the proper way by not giving up anything of our energy dominance. That is what makes us the superpower of the world.

The IRA is bringing more investments to this country than ever before and it is happening in states all across the nation—red and blue states. I don't understand red and blue states, I just understand American states, but we are all benefiting from it, no matter what your political preference is, and DOE will play a critical role in supporting all of this with programs that provide financial assistance for battery materials, processing, manufacturing, and recycling projects in the United States, and loans and loan guarantees

for every part of the EV supply, from mining to manufacturing, through the Loan Programs Office. In fact, electric vehicles and battery makers announced $52 billion in investments in North American supply chains before the Administration started loosening these rules. That was before, based on how the bill was written, but if they keep bending the rules, we are going to lose the momentum and we cannot afford to let happen.

Mr. Turk and Mr. Adeyemo, let me just end by thanking you both, again, for appearing here today to correct and help us through this. You have always taken the time to hear me out on these issues, and while we have different perspectives, I have the utmost respect for both of you. I look forward to a constructive conversation today about how we can achieve a more reliable supply chain for American EVs.

And with that, I will turn to the Ranking Member, Senator Barrasso, for his comments.

OPENING STATEMENT OF HON. JOHN BARRASSO, U.S. SENATOR FROM WYOMING

Senator BARRASSO. Well, thanks, Mr. Chairman. Thank you for holding this hearing on federal subsidies for electric cars. These government handouts are the centerpiece of the disastrous so-called Inflation Reduction Act. Just about everything that President Joe Biden claimed about the IRA is false. And Mr. Chairman, I am happy that you showed those signs, which point out the lawlessness of the Biden Administration when it comes to the law. What the IRA really stands for to me is "irresponsible, reckless, and alarming."

So let's start with the cost. According to a Goldman Sachs analysis, the electric car subsidies in the IRA will cost an estimated $393 billion. That analysis is 28 times more than what the Congressional Budget Office estimated. Our national debt is now $34 trillion, and thanks to the IRA, we are about to spend hundreds of billions of dollars that we don't have to subsidize electric cars that the great majority of Americans do not want. This is especially true in Wyoming, where electric cars simply cannot compete with conventional vehicles. The fact is, electric car subsidies go primarily to the State of California, where nearly 40 percent of all electric cars in America are being sold. So hardworking families in my home State of Wyoming and the Chairman's home State of West Virginia and other states represented significantly by members of this Committee, really, are getting stuck subsidizing wealthy people from California. The IRA is a shakedown.

It is also becoming very clear that President Biden hasn't thought through the consequences of his so-called energy transition. His efforts to force-feed Americans electric cars is going to cause greater instability—greater instability—in our nation's electric system. There is a group we refer to as NERC. It is the North American Electric Reliability Corporation. It has warned of increased risks from the premature closure of coal and natural gas power plants. The Biden Administration does not seem to care. The Biden Administration is working to shut down even more of these power plants while promoting a huge new source of demand on the grid, which is, of course, electric cars. Just consider that fully

charging a single electric car consumes the same amount of electricity needed to power an entire house during times of peak demand. Does the President have any clue that his math is not working?

No one really believes that two-thirds of the new cars sold in America in 2032 are going to be electric. The Biden Administration's fixation on these electric cars amounts to wishful thinking on his part. But despite generous subsidies, the demand for electric cars is stagnating. Car dealers are opting out of selling them and opting out of servicing them. Compared to owners of conventional cars, owners of electric cars are paying higher repair costs, higher insurance rates, and by the way, they are getting less resale value. The headline today, Mr. Chairman, and I ask unanimous consent to put this in the record, is from Bloomberg. We talked about resale values. Hertz reports today they are going to sell 20,000 EVs in its shift back to gas-powered cars. So much for the Biden economy.

The CHAIRMAN. Without objection.

[The article referred to follows:]

Hertz to Sell 20,000 EVs in Shift Back to Gas-Powered Cars

By David Welch and Richard Clough | January 11, 2024 10:41AM ET

- Rental company cites customer demand, costs for fleet change
- Hertz announced large purchase of Tesla vehicles in 2021

Updates from fourth paragraph with CEO comments

Hertz Global Holdings Inc. plans to sell a third of its US electric vehicle fleet and reinvest in gas-powered cars due to weak demand and high repair costs for its battery-powered options.

The sales of 20,000 EVs began last month and will continue over the course of 2024, the rental giant said Thursday in a regulatory filing. Hertz will record a non-cash charge in its fourth-quarter results of about $245 million related to incremental net depreciation expense.

The dramatic about-face, after Hertz announced plans in 2021 to buy 100,000 Tesla Inc. vehicles, underscores the waning demand for all-electric cars in the US. EV sales growth slowed sharply over the course of 2023, rising just 1.3% in the final quarter as consumers were put off by high costs and interest rates.

See Also: Car-Rental Firms Confront Early Bumps in Road to EVs

"The elevated costs associated with EVs persisted," Hertz Chief Executive Officer Stephen Scherr said in an interview. "Efforts to wrestle it down proved to be more challenging."

Source: Bloomberg

WATCH: Hertz Global Holdings plans to sell electric cars from its US fleet and will reinvest in gas-powered cars. Craig Trudell reports.

Hertz's shares fell 4.3% to $8.95 as of 10:01 a.m. in New York. The stock declined 32% last year.

Going forward, Hertz will keep a close eye on EV demand both at dealerships and within its own operations to decide whether the company should buy more vehicles, Scherr said. That means its agreement to buy 175,000 EVs from General Motors Co. over the next four years and another 65,000 from Polestar may take much longer to complete, he said.

What Bloomberg Intelligence Says:

"Hertz recorded elevated costs from its EV fleet in 2H23. Management said the reversal could boost free cash flow by $250-300 million in 2024-25 and improve corporate Ebitda, but we see the reshuffling as material growing pains."

— Jody Lurie, BI senior credit analyst

Click here to read the research.

Hertz plans to use some of the money raised by selling off EVs to buy gas-powered vehicles. "The company expects this action to better balance supply against expected demand of EVs," it said in the filing.

The shift back to more conventional cars marks a reversal of a strategy centered on EVs, which the company hoped would fetch higher prices at the counter and hold their value. Tesla's price cuts over the past year lowered the value of the cars in Hertz's fleet and with EV sales growth slowing, it's not clear if consumers will have an appetite for them in the used-car market.

Read more: How China's Carmakers Came to Dominate the EV Sector: QuickTake

Hertz is keen on GM's plan to sell cheaper EVs, like a future redesign of the Chevolet Bolt, which sold for under $30,000 before ending production last year, and a $35,000 Chevy Equinox that is going into production. Those vehicles could be easier to rent profitably, Scherr said.

"We're committed to the strategy" Scherr said. "It will take more time to execute it."

Earnings Boost

The plan to unload EVs should improve Hertz's cash flow and earnings this year and next. By year-end 2025, the company expects improved financial results driven by higher revenue per day and lower depreciation and operating expenses. The company sees incremental free cash flow of as much as $300 million in the aggregate over 2024 and 2025.

Scherr had signaled this shift would come, saying in October that the company would scale back on EVs, which had made up 11% of its total fleet. Teslas represented 80% of that.

Tesla's price cuts raised his company's depreciation costs, Scherr said. EVs also come with higher repair costs compared to the rest of its cars, which has hurt its bottom line and played a big role in missing third-quarter earnings estimates.

"EV's will be slower than our prior expectations," he said during the company's third-quarter earnings call.

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Senator BARRASSO. So the first paragraph of this, "Hertz Global Holdings plans to sell a third of its U.S. electric vehicle fleet and reinvest in gas-powered cars due to weak demand and high repair costs for its battery-powered options." The American public is seeing exactly the same thing, and they are getting hit with similar bills.

The damage that the IRA will do to America's automotive sector is potentially catastrophic. In the first nine months of 2023, Ford Motor Company alone lost $3.1 billion on electric cars. Losses like that cannot go on for long. Perhaps worst of all, the IRA plays right into the hands of the Chinese and other foreign companies. You have heard the expression "follow the money." Well, if you want to follow the IRA money, the so-called Inflation Reduction Act, you are going to need a passport, because the money is going all over the world. Mr. Chairman, as you have repeatedly pointed out, the Biden Administration has allowed electric car subsidies to flow to foreign companies in countries that are hostile to American interests. Recently, the Chinese car maker BYD topped Tesla as the world's largest electric car manufacturer. In Europe, that company outsold Tesla in the last quarter of 2023. BYD's goal is to be the biggest electric car manufacturer in Europe by the year 2030. The Administration has said it welcomes Chinese companies as big players in renewable and electric car markets. This is a terrible mistake. The IRA will push us away from the fuels and technologies where America has the lead and push us toward the minerals and technologies that are currently controlled by China.

We need to change course. President Biden wants to subsidize and regulate our way to greater energy security and lower emissions. He wants to force the nation to adopt a single technology that only works in certain zip codes. This is a recipe for failure. We need to return to a pro-America, all-of-the-above energy strategy. We also need a comparable all-of-the-above vehicle strategy, a strategy that includes more efficient internal combustion engines, hydrogen fuel cells, compressed natural gas, and hybrid vehicles. These are technologies that can increase consumer choice while also reducing emissions.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

One note: the bill prevented all Chinese cars from getting any credits in the United States. We did that.

Senator BARRASSO. Our enemies are getting the money.

The CHAIRMAN. Senator Wyden

OPENING STATEMENT OF HON. RON WYDEN, U.S. SENATOR FROM OREGON

Senator WYDEN. Thank you very much, Mr. Chairman, and as Chair of the Senate Finance Committee, which has jurisdiction over the climate tax credits, like the new clean vehicle credit, I am glad that we are continuing what we began in early summer 2021. You and I remember the history—you invited me and Senator Murkowski to come to West Virginia and we began the efforts to get it right. And I want to make sure that some key points really get out that address the heart of what we did.

Our colleague from Wyoming, my friend and neighbor, Senator Barrasso, said something about all-of-the-above. Well, starting in 2012, Senator Manchin and I began the effort to build the foundation of our energy policy on what Senator Manchin and I called technological neutrality, which was one better, colleagues, because it ensured the competitiveness of our energy system, while at the same time, giving everybody a chance to be inventive and creative, because nobody knew what the big energy sources would be 20 years down the road. And then Senator Manchin and I, because I remember the expression on his face when I asked him about technological neutrality because we hadn't really gotten into that early in 2012—I said the other thing we need to do is to say the more you reduce carbon, the bigger your tax savings. And Senator Manchin swallowed hard and said, yeah, does that include carbon capture and nuclear and the like? I said, you're darn right it does. So I want it understood that that was the foundation of what actually became law—market oriented, no mandates, private sector, and we were still focused on climate.

Now, let me just make a couple of quick points on EVs. The issue with respect to EVs, Senator Manchin and I realized back then it was going to be an issue of climate, jobs, and matters like supply chains. And what we have sought to do with Secretary Adeyemo, and we worked, I think, in a very constructive kind of way, and we have been able to show that climate, jobs, and secure supply chains, they are not mutually exclusive. Smart policies can get you progress in all three areas. And working with Mr. Adeyemo, I think we have achieved that. Now, we understand—and the Chairman is talking about this—we have continued work to do to make sure of the relationship between the Department of Energy and Treasury so that we continue to make progress. We are committed to doing that, but the fact is, we are making progress. The automakers already are making changes in the supply chains, making sure that we are getting real improvement. We are seeing buildout of charging stations and progress there.

So we are going to continue in the spirit of what we did in 2012, when we said technological neutrality, folks. It is an improvement on even all-of-the-above because it's more science-oriented, creates incentives for everybody to see in a federal system. So this is an exciting bit of progress that we are discussing. Senator Manchin made mention of some of the announcements—over $150 billion of investment in electric vehicles and batteries, big economic win. We have more to do, and I look forward to working with my colleagues. And I also note that Senator Barrasso is a valuable member of the Finance Committee, and we will be able to continue those discussions.

The CHAIRMAN. Senator Barrasso.

Senator BARRASSO. Yes, Mr. Chairman, the comment that you made about the IRA not allowing tax credits for Chinese electric vehicle purchases, but the IRA, and this will be part of my questioning today, does allow leased Chinese electric vehicles to qualify, and to me this is a massive loophole.

The CHAIRMAN. I agree with you a thousand percent, and that's what we are trying to stop.

So with that, we turn to our witnesses now for their opening remarks. We have the Honorable David Turk, Deputy Secretary of Energy, and we have the Honorable Wally Adeyemo, a friend to all of us who we know very well and work very close to, from the Department of the Treasury.

So we will start with David Turk.

STATEMENT OF HON. DAVID M. TURK, DEPUTY SECRETARY, U.S. DEPARTMENT OF ENERGY

Mr. TURK. Chairman Manchin, Ranking Member Barrasso, Chairman Wyden, and other members of the Committee, thank you for the opportunity to be with you all today.

For decades, the United States has sat idle while our global competitors have taken control of critical supply chains. Chairman, you raised some numbers. I will share a few other numbers here as we begin the discussions. China currently processes—and I really want to underscore processing, the processing stranglehold that China has right now—65 percent of the world's lithium and cobalt. It is 100 percent when you look at graphite that China processes right now. Now, thanks to President Biden and the landmark Bipartisan Infrastructure Law and the Inflation Reduction Act—and I want to give a particular thanks to this Committee, the Chairman, in particular, but this whole Committee for your leadership on those historic pieces of legislation—we are fighting back. Chairman, you mentioned that the IRA is the most transformative bill. I would say the BIL and the IRA together are the most transformative bills we have ever had in our country when it comes to supply chains, diversifying, and increasing the reliability and the resilience of those supply chains.

Already we have made multi-billion-dollar grant cost-share investments in battery manufacturing all across our country, $16 billion of conditional commitments through our loan program at the Department of Energy, and powerful tax incentives are just starting to kick in. And these tools that you have given us are working. Since President Biden took office, we have leveraged over $157 billion in private investments in the EV supply chain—$157 billion of private investment so far, over 340 new or expanded facilities, again, all across our country, and 136,000 estimated new direct jobs. And that is just the direct jobs from this investment. There are an additional hundreds of thousands of indirect jobs because of this investment in this strategy. Domestic EV sales have quadrupled since President Biden took office. If you look at the 2022 numbers and compare that to 2023, we have had a 50 percent increase in our electric vehicle sales in our country.

Ranking Member Barrasso, you spoke about affordability. We now have models, including the Chevy Bolt that's under $20,000, and a full EV version. I asked the team to take a look at existing gas prices and electricity prices and what is the difference in terms of how you fuel up, whether you fuel up an internal combustion or an EV. Right now, the average across our country is $46 to fuel up if you have an internal combustion engine. That number is $15—$15—if you charge up at home, the average across our country. And thanks just to the investments we have been able to make so far with these historic pieces of legislation, domestic lithium pro-

duction in our country is expected to increase 13-fold by 2030. Domestic graphite production will increase 25-fold. And those are the results for the investments we have only made so far. There is so much more to come.

Let me spend a few minutes sharing what this targeted strategic industrial strategy means for three specific communities, all of which are receiving DOE support. First, St. Gabriel, Louisiana. Koura is a company that opened a fluorochemical plant in St. Gabriel in 1991. In October 2022, they announced expansion to produce lithium hexafluorophosphate. Every EV battery needs this. China currently dominates the market. The U.S. produces zero right now. Koura will be the first U.S./American manufacturer. They received $100 million in a grant from DOE, again, a cost-share that is leveraging twice, three times, the amount on the private-sector side. And St. Gabriel will have 80 new jobs because of this strategy, because of this investment.

Second, St. Louis, Missouri. St. Louis has been a leader in phosphates for nearly 150 years. In August last year, ICL broke ground on a $400 million battery manufacturing plant, producing enough cathode active materials for 1.3 million EVs, $197 million in DOE investments, leading to 150 new jobs in the St. Louis community.

And third, Weirton, West Virginia. As our Chairman knows, a former steel town that was once the fifth largest steel producer in our country. Unfortunately, that plant closed down 20 years ago and a third of the population moved away. Thanks to this historic legislation, thanks to the Chairman's leadership with these historic pieces of legislation, in November, Boston Metal was selected for $50 million in a grant to manufacture critical materials for fuel cells, translating to 200 new jobs in Weirton. And Form Energy broke ground last year on a $760 million iron air battery manufacturing plant that will create an additional 700 jobs for that community.

And we are only getting started. Let me conclude by again thanking this Committee for your leadership in giving us these historic tools. And thank you for your continued partnership as we use all these tools to improve the resilience and reliability of our supply chains to accelerate our clean energy progress, to support hundreds of thousands of family-supporting jobs all across our country, and for revitalizing our communities. We look forward to seizing all these opportunities together. Thank you, Chairman.

[The prepared statement of Mr. Turk follows:]

STATEMENT OF

DAVID TURK, DEPUTY SECRETARY

U.S. DEPARTMENT OF ENERGY

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES

UNITED STATES SENATE

REGARDING

ELECTRIC VEHICLE SUPPLY CHAINS

JANUARY 11, 2024

Introduction

Chairman Manchin, Ranking Member Barrasso, and distinguished Members of the Committee, thank you for the opportunity to be with you today to discuss the efforts of the Department of Energy (DOE) to strengthen the reliability and resilience of our country's supply chain for electric vehicles.

My DOE colleagues and I thank Congress and, in particular, this Committee for passing landmark infrastructure and energy legislation in the Bipartisan Infrastructure Law (BIL) and the Inflation Reduction Act (IRA). With the tools you have provided DOE – and under the leadership of President Biden and in full coordination with the Treasury Department and other agencies – we are already making substantial progress in reducing costs for consumers, improving our economic and national security, improving energy equity while advancing environmental justice, bolstering domestic manufacturing, and improving the availability and access of reliable charging infrastructure across our country.

I am pleased to share that since the beginning of the Biden Administration and with the passage of these historic laws, our shared efforts have so far helped lead to $157 billion in announced private domestic investments for electric vehicles (EVs) and batteries.[1] And that number continues to grow every month. This level of investment means 130,000 estimated new jobs and enough batteries to power approximately 10 million new EVs per year by 2030.[2]

DOE's work to ensure critical minerals and materials supply chains, including those that support the manufacturing and production of electric vehicles, involves multiple offices across our Department, and spans the full continuum of Research, Development, Demonstration, and Deployment (RDD&D), including:

[1] https://www.whitehouse.gov/invest/

[2] Light Duty Electric Drive Vehicles Monthly Sales Updates | Argonne National Laboratory (anl.gov)

- developing new materials and chemistries through fundamental research in our Office of Science;
- improving the environmental footprint and efficacy of critical mineral extraction through the Office of Fossil Energy and Carbon Management (FECM);
- accelerating cutting-edge technologies, including high density batteries with lower or no dependence on critical materials and innovative battery recycling, within the Office of Energy Efficiency and Renewable Energy (EERE);
- demonstrating and assisting the commercialization of new and improved manufacturing facilities through the Office of Manufacturing and Energy Supply Chains (MESC); and
- helping companies to cross the bridge to full market acceptance through the Loan Programs Office (LPO).

The Department also works with a variety of interagency partners. For example, DOE supports, including through our analysis and technical expertise, the development of tax policy by the Treasury Department and Internal Revenue Service. DOE also works closely with the State Department, United States Agency for International Development (USAID), the Development Finance Corporation, the Export-Import Bank of the United States (Ex-Im) and others to strengthen efforts with key partner countries around the world to further diversify supply chains.

Throughout, we must ensure that all these activities that benefit American companies, workers and communities do so in a way that also protects against harmful foreign influence. Accordingly, the Department has developed a comprehensive and rigorous approach to research, technology, and economic security (RTES) policy and procedures for our awards and loans. DOE has developed, and continues to improve upon, a number of RTES measures to mitigate risk that malign foreign governments pose to our scientific and technological development ecosystem, supply chains, and intellectual property.

Through the targeted and strategic use of all these tools, the United States is making historic progress toward reshoring and revitalizing domestic manufacturing, strengthening, and diversifying our critical mineral and energy supply chains, and continuing the drive for more innovative technologies that will lead the global market.

Critical Material and Mineral Supply Chains

The Biden-Harris Administration is keenly aware of the importance of a strong domestic supply chain, including for electric vehicles.

President Biden signed Executive Order 14017, *America's Supply Chains*, on February 24, 2021, directing each department in the administration to assess potential supply-chain risks within their jurisdiction and to develop strategies to mitigate and overcome any deficiencies.[3] This Executive Order expanded work previously directed in EO 13953, *Addressing the Threat to the Domestic*

[3] Executive Order on America's Supply Chain. February 24, 2021. Available at https://www.whitehouse.gov/briefing-room/presidential-actions/2021/02/24/executive-order-on-americas-supply-chains/

Supply Chain from Reliance on Critical Minerals from Foreign Adversaries and Supporting the Domestic Mining and Processing Industries from September 30, 2020.[4]

In February of 2022, DOE released a report titled *America's Strategy to Secure the Supply Chain for a Robust Clean Energy Transition*, followed by a Critical Materials Assessment in July of 2023.[5] DOE's Critical Materials List includes key elements and components for the electric vehicle battery supply chain, including lithium, graphite, nickel, and cobalt.

To meet the projected demand for critical minerals and materials, the U.S. must develop multiple sources (upstream) for critical materials. However, that alone will not be sufficient to establish resilient supply chains. A lack of processing and refining capabilities (midstream), as well as manufacturing (downstream), often poses a greater risk to supply chain robustness than the sources themselves. For example, the U.S. mines the largest amount of rare earth elements of any country other than the People's Republic of China (PRC), but we currently ship much of this raw material to the PRC for future processing and refining.[6] For most critical materials, midstream processing represents the greatest U.S. challenge, as was recently demonstrated by China's formalization of a ban on technology exports used to extract and separate critical materials.

The PRC maintains a dominant position in the midstream processing capabilities for several different critical materials, including graphite and cobalt. By intervening in each stage of the supply chain for over three decades, PRC non-market policies and practices have resulted in market distortions that have made it very difficult for midstream processing capabilities to be built in the U.S. or other countries. Dependence on a single source for these materials leaves the U.S. and our allies vulnerable. Therefore, we must ensure sufficient worldwide supplies of critical materials from responsible sources to protect U.S. national security and enable a clean energy and industrial economy.

Fortunately, thanks again to the leadership of this committee and others, we have a variety of new tools and resources that leverage decades of research and development conducted by DOE and our National Labs to build domestic manufacturing and to strengthen our energy supply chains.

Deploying New Programs to Strengthen Energy Supply Chains and Domestic Manufacturing

It is urgent to get new commercial midstream technology in place in the U.S. to establish domestic supply chains. With funding from the BIL and IRA, the DOE's Manufacturing and Energy Supply Chains and Loan Programs Offices are leading these efforts.

MESC works to strengthen and secure energy supply chains and manufacturing to modernize U.S. energy infrastructure and to support the clean energy transition. To this end, MESC is

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[4] https://www.govinfo.gov/content/pkg/FR-2020-10-05/pdf/2020-22064.pdf
[5] https://www.energy.gov/policy/articles/americas-strategy-secure-supply-chain-robust-clean-energy-transition; https://www.energy.gov/sites/default/files/2023-05/2023-critical-materials-assessment.pdf
[6] https://pubs.usgs.gov/periodicals/mcs2023/mcs2023.pdf; https://mpmaterials.com/articles/mp-materials-reports-second-quarter-2023-results/

implementing provisions in the BIL, the Defense Production Act, and the IRA, including targeting over $6 billion in BIL funding to support battery materials processing, manufacturing, and recycling, as well a $2 billion in IRA funding to convert the automotive facilities and jobs to support the electric vehicle transition. Additionally, LPO has issued or committed more than $16 billion for several critical materials production and recycling and battery supply chain projects. A summary of those programs and progress to date is outlined below.

Manufacturing and Energy Supply Chains

The Bipartisan Infrastructure Law authorized and appropriated approximately $6 billion for DOE to support the sourcing of battery critical materials and accelerate battery production in America. With the global electric vehicle and grid storage battery market expected to grow rapidly over the next decade, DOE is working with industry to prepare the United States for this increased demand.

Through 2022 and 2023, MESC has stewarded two rounds of funding for activities that support **BIL Section 40207(b) Battery Materials Processing Grants** and **BIL Section 40207(c) Battery Manufacturing and Recycling Grants** with the aim to reach across both the midstream and downstream segments of the battery supply chain, supporting both midstream battery materials and component manufacturing, as well as subsequent cell manufacturing and end-of-life recycling.

DOE issued the first "Battery Materials Processing and Battery Manufacturing" funding opportunity in May 2022. Applicants responded to 12 distinct areas of interest from material precursor production to cell fabrication. DOE has closed the negotiations of the first-round selections, catalyzing over $4 billion in private sector investment, the creation of over 10,000 jobs, significant investment in energy communities, training of over 700 students, and the ability to produce an additional 1.3 million electric vehicles each year. These investments will create opportunities and economic development in 11 states across the country, and include awards in Nevada, Missouri, Washington State, Louisiana, North Dakota.

In November 2023, DOE issued the second round of funding for "Battery Materials Processing and Battery Manufacturing," for which full applications are due March 2024, and selection announcements are anticipated in July 2024.

The **Qualifying Advanced Energy Project Credit (48C)** program was established by the American Recovery and Reinvestment Act of 2009 and expanded with an additional $10 billion in tax credits to be allocated under the Inflation Reduction Act. The Qualifying Advanced Energy Project Credit of § 48C of the Internal Revenue Code, provides allocated tax credits for investments in qualifying advanced energy projects. The Department of the Treasury and the Internal Revenue Service, in partnership with DOE, have preliminarily allocated up to $4 billion in a first-round allocation of tax credits for projects, which includes electric vehicles as a priority area. The § 48C program, as a uniquely competitive and broad investment tax credit, is strategically positioned to help facilitate the acceleration of the EV industry regarding component manufacturing and materials critical for the EV industry. DOE's MESC is currently undertaking the competitive review process for this program.

Key battery components are eligible for tax credits under the **Advanced Manufacturing Production Tax Credit** of § 45X of the Internal Revenue Code. The § 45X tax credit is a powerful incentive that strengthens clean energy manufacturing and boosts manufacturers investments in the United States and will help drive down the cost of EVs. Since the passing of IRA, manufacturers have invested over $157 billion to expand production capacity for batteries and EVs, already showing the power of these tools to help build a resilient U.S. EV industry.

Finally, on August 31, 2023, MESC announced the **Domestic Manufacturing Conversion Grants program.**[7] This program, funded by the Inflation Reduction Act Section 50143, provides $2 billion in competitive grant funding, available through September 30, 2031.[8] This program targets manufacturers who are converting an existing domestic internal combustion engine vehicle or internal combustion engine vehicle component manufacturing facility into an electric vehicle or hybrid vehicle component facility. Full submissions are due on January 23, 2024, and selection announcements will be made in Spring 2024, with negotiations and awards scheduled to occur between June 2024 and October 2024.

Loan Programs Office

The Department's Loan Programs Office (LPO) provides financing to support the commercialization and deployment of innovative energy infrastructure and advanced vehicle technology manufacturing projects in the United States. LPO is authorized to support a range of innovative battery technologies, including those outside of conventional lithium-ion batteries, through both its Advanced Technology Vehicles Manufacturing (ATVM) and Title 17 Clean Energy Financing (Title 17) programs.

Under the ATVM program, LPO has authority to finance commercial-scale manufacturing facilities for advanced technology vehicles and eligible components, including facilities to manufacture electric vehicle chargers or to process critical minerals for advanced technology vehicles. Through the Bipartisan Infrastructure Law, the program was expanded to include medium- and heavy-duty vehicles as well as other modes of transportation, including aircraft, maritime, and locomotives.

Under Title 17, LPO also has authority to provide loans and loan guarantees for commercial-scale energy projects, including for those projects that increase the domestically produced supply of critical minerals. The Title 17 program may also finance the deployment of electric vehicles and charging stations as part of an energy project.

Since 2021, through LPO's ATVM program, the Department has issued or committed more than $16 billion for projects across the electric vehicle and component supply chains in Arizona, Kentucky, Louisiana, Michigan, New York, Nevada, Ohio, Tennessee, and Texas. Furthermore, as of November 2023, the ATVM program has received additional applications totaling over $23

[7] Domestic Manufacturing Conversion Grants | Department of Energy
[8] IRA Section 50143 - Hybrid and Electric Vehicle Grants - Inflation Reduction Act Tracker (iratracker.org)

billion from companies across the United States – a testament to the trust LPO has fostered with the private sector, and the continued interest from industry in DOE financing.

RDD&D Continuum

These BIL and IRA programs build on longstanding and ongoing work from DOE's applied energy office. For example, EERE's Advanced Materials and Manufacturing Technologies Office manages an applied RDD&D portfolio that addresses high-impact innovation opportunities and challenges across the life cycle of critical minerals and materials for clean energy. This includes the Critical Materials Innovation (CMI) Hub, a public-private consortium of national laboratories, universities, and industry focused on technologies that make better use of materials and eliminate the need for materials that are subject to supply disruptions.

Since its inception in 2013, CMI research has been awarded forty-seven U.S. patents, licensed twenty technologies, and received five Federal Laboratory Consortium awards, twelve R&D 100 Awards, and over $80 million in follow-on funding. Funding from BIL has accelerated the commercialization of CMI-developed technology to recycle critical materials from lithium-ion batteries.

Research, Technology, and Economic Security (RTES)

With the enactment of BIL and IRA, the Department developed a comprehensive and rigorous approach to research, technology, and economic security (RTES) policy and procedures for its awards and loans, including those for electric vehicles and battery supply chains. To ensure a robust RTES approach, DOE took three major actions to address the many forms of RTES risks.

First, DOE enhanced its existing vetting processes to ensure that risks of undue foreign influence are considered early in the competitive process and throughout the life of a DOE supported project or loan. DOE also included strict RTES requirements for its financial assistance and loan programs. Second, DOE established a department-wide RTES working group to review, develop, and assist in the implementation of RTES policies. Third, the Department established a new RTES Office to implement DOE's enhanced vetting process for financial assistance and loan projects, build awareness internally within DOE on RTES issues, engage with external stakeholders, and review DOE national lab agreements involving foreign entities.

Battery and Critical Mineral Recycling

Critical mineral and material recycling is a key step to address materials scarcity, enhance environmental sustainability, and support a U.S.-based battery recycling ecosystem while reducing reliance on China for critical materials.

DOE's review of large-capacity batteries indicated that 20 percent to 40 percent of nickel and cobalt needs for new batteries could be met with cobalt recovered from recycling batteries as soon as 2030.[9] Recycling can dramatically decrease the cost, energy and water use compared to

[9] https://www.whitehouse.gov/wp-content/uploads/2021/06/100-day-supply-chain-review-report.pdf

conventional mining. One ton of battery-grade cobalt, for example, can be recovered from 5 to 15 tons of spent lithium-ion batteries, which requires the equivalent of 300 tons of ore.[10] RDD&D can enable competitive recycling technology in the future. In the near term, sourcing 10 percent of material needs from recycling can support stressed supply chains and reduce the threat of supply shocks.

EERE's Vehicle Technologies Office is also spurring innovative solutions to collect, sort, store, and transport spent and discarded lithium-ion batteries for eventual recycling and materials recovery.

To move to demonstration, DOE's MESC office has made available $50 million from the **Bipartisan Infrastructure Law's Consumer Electronics Battery Recycling, Reprocessing, and Battery Collection** program to promote domestic battery manufacturing and recycling, to address a need to provide for the general collection, recycling, and reprocessing of batteries. DOE anticipates that selections and awards will be announced in 2024.

Furthermore, LPO can finance projects that deploy innovative critical minerals recycling processes, or that recycle critical materials for eventual end use in eligible advanced technology vehicles or their components. In 2023, the Department announced two conditional commitments under the ATVM program for battery resource recovery and components recycling projects.

Building a National Charging and Fueling Network

The Joint Office of Energy and Transportation was created through the BIL to facilitate collaboration between the U.S. Department of Energy and the U.S. Department of Transportation. The Joint Office has been working to support the Federal Highway Administration with implementation of the $5 billion National Electric Vehicle Infrastructure (NEVI) Formula Program and $2.5 billion Charging and Fueling Infrastructure (CFI) Discretionary Grant Program. To date, the Federal Highway Administration has made over $2.4 billion available to states through NEVI to electrify over 84,000 miles of the National Highway System. Additional awards are expected in early 2024.

We are pleased to share that last month, Ohio and New York marked the first states in our nation to open EV charging stations funded through the NEVI Program. These new charging stations will fill gaps in charging, add capacity, and boost the reliability of our nation's fast charging network. Other new charging station launches will follow soon, with stations already under construction in Maine, Pennsylvania, and Vermont. The private sector is currently adding nearly 1,000 publicly-available chargers per week—bringing us to a grand total of more than 167,000 chargers across the country.

The development and maintenance of a robust charging network will create jobs and stimulate economic growth in local communities, while public and private investments in EV charging infrastructure will catalyze technological innovation across multiple economic sectors. Forty-

[10] https://www.energy.gov/sites/default/files/2021-06/FCAB%20National%20Blueprint%20Lithium%20Batteries%200621_0.pdf

three new domestic EV charging manufacturing facilities have been announced to be built or expanded in 17 states since January 2021. Collectively these facilities account for well over $500 million in private sector investment resulting in the potential for over 3,500 new American jobs.

Underpinning all of these programs is the technical assistance that the Joint Office is providing to states, Tribal nations, and communities. To date, the Joint Office has fielded over 5,200 technical assistance requests through DriveElectric.gov and has regular discussions with states implementing NEVI.

The Joint Office is also working closely with the private sector to provide impactful solutions that help enhance the charging experience for all, including the National Charging Experience Consortium, an effort launched in May 2023 and led by DOE's National Laboratories that is working to rapidly develop solutions that ensure a reliable and frictionless charging experience for all Americans. To date, the Consortium has over 70 private sector partners contributing to the effort.

Enhancing Domestic Resources

In addition to the development and deployment of manufacturing, recycling, and processing capacity, DOE is working to identify new feedstocks for critical minerals and materials, including from secondary sources such as wastes from coal and hard rock mining and industrial processes, as well as expanding traditional sources from existing mining and international partners.

Secondary and unconventional feedstocks encompass many potential sources, including coal and coal byproducts, coal wastes, produced water from oil and gas production, ionic clays, hard rock mine tailings, acid mine drainage, bauxite residue, and phosphate sludge. Together, these sources have the theoretical potential to provide enough rare earth elements to meet the nation's needs for decades, as well as significant quantities of other critical minerals and materials resources.[11] For most secondary and unconventional resources, there is an opportunity for remediating the environmental impacts and reducing the waste from mining and other extraction activities. RDD&D in this area is geared toward commercial scale development, with a BIL funded DOE REE demonstration facility being built this decade.

FECM's Carbon Ore, Rare Earth, and Critical Minerals (CORE-CM) initiative supports regional coalitions of academia, industry, States, NGOs, and Tribal entities, that assess the potential for developing domestic supply chains using secondary and unconventional feedstocks. Billions of tons of coal waste and coal ash have been generated over the past two centuries and remain in waste piles or impoundments.[12] These and similar feedstocks represent a significant opportunity

[11] Report to Congress on Recovery of Rare Earth Elements and Critical Minerals from Coal and Coal By-Products. Available at https://www.energy.gov/sites/default/files/2022-05/Report%20to%20Congress%20on%20Recovery%20of%20Rare%20Earth%20Elements%20and%20Critical%20Minerals%20from%20Coal%20and%20Coal%20By-Products.pdf

[12] "Domestic Wastes and Byproducts: A Resource for Critical Material Supply Chains." Evan J. Granite, Grant Bromhal, Jennifer Wilcox, and Mary Anne Alvin, National Academy of Engineering, The Bridge, 53(3), 59-66, Fall 2023.

to diversify the supply of critical minerals and materials resources while remediating longstanding environmental degradation and creating good jobs in mining and energy communities. Ultimately, new and innovative approaches would help extract resources in a responsible and sustainable manner.

To that end, DOE is evaluating the potential for additional RDD&D investments to advance technological solutions and revolutionize mining into a more targeted enterprise that uses "surgical" approaches to extract minerals from ever deeper sources, minimize surface and environmental impacts, and improve public confidence in responsible mining techniques. Technology development areas for future mining research would likely include advanced drilling technologies, digital subsurface applications (autonomous operations, robotics, real-time extraction), *in situ* mineral extraction, novel processing, and tailings management. Data collection and management capabilities will also be critical in such an effort, as well as the building of a traceability capability with verification for all major critical materials.

FECM is also advancing an RDD&D portfolio geared toward increasing the domestic production of critical materials in the United States. Research is focused on extracting, separating, and recovering rare earth elements and critical materials from unconventional and secondary sources. We have had success in this area, including the design, construction, and operation of five first-of-a-kind bench and small pilot-scale facilities that are producing high-purity mixed rare earth oxides/salts from coal-based resources using conventional beneficiation and separation processes. FECM has released several BIL-related FOAs this year to help accelerate these efforts.[13,14,15] We are also developing more energy efficient synthetic graphite, graphene, and carbon anode materials from coal, coal waste, and coal byproducts.

Additionally, through prize competitions, EERE's Geothermal Technologies Office is incentivizing innovators to de-risk and increase market viability for direct lithium extraction from geothermal brines.

Finally, in addition to this fundamental R&D, we are deploying additional resources in demonstration, including through the MESC Rare Earth Element Demonstration Facilities that will extract rare earth elements from unconventional feedstock materials, such as lignite coal and acid mine drainage.

For example, in August 2023, DOE's FECM and MESC awarded West Virginia University and the University of North Dakota under the Rare Earth Element Demonstration Facility Funding Opportunity Announcement (DE-FE-0002618). The funding opportunity will be completed in two phases and will invest up to $156 million for the design, construction, and operation of a facility that demonstrates the extraction, separations, and refining from unconventional feedstock materials to high purity rare earth elements and/or critical materials. The activities will be

[13] September 6, 2023 Funding Opportunity Announcement: https://www.energy.gov/fecm/funding-notice-critical-materials-innovation-efficiency-and-alternatives
[14] August 21, 2023 Funding Opportunity Announcement: https://www.energy.gov/fecm/funding-notice-bipartisan-infrastructure-law-advanced-processing-critical-minerals-and
[15] July 13, 2023 Funding Opportunity Announcement: https://www.energy.gov/fecm/funding-notice-bipartisan-infrastructure-law-front-end-engineering-and-design-feed-studies

significant as MESC seeks to commercialize the technology to add commercial quantities of mixed rare earth oxides into our supply chain.

Additional Collaborations

Building new supply chains, charging infrastructure, and a revived domestic manufacturing sector in the United States requires deep inter-governmental coordination. To better collaborate across both DOE offices and the interagency to establish diverse, secure, and sustainable supply chains, the Biden Administration launched the American Battery Materials Initiative (ABMI) in October 2022. The ABMI is a DOE-coordinated interagency effort to secure the minerals and materials needed for everything from batteries to defense systems. It works to coordinate federal investment across the interagency to meet the Administration's short- and long-term critical minerals goals; support policies and solutions to solve the biggest critical mineral supply chain chokepoint—minerals processing; and align responsible mining and processing standards.

Since naming an Executive Chair, ABMI is taking steps to ensure effective internal coordination and external engagement across the critical minerals and battery sector, including streamlining information sharing and ensuring investments are optimized to meet economic and national security goals. The initiative will further ensure that American jobs and taxpayer dollars are protected from unfair behavior by leveraging existing tools and identifying new ones to safeguard against anticompetitive practices, such as undue export controls and market manipulation. As a part of this effort, ABMI is working with industry to identify remaining hurdles and new ways the U.S. government can partner to fortify nascent parts of the domestic supply chain, including minerals processing and battery component production.

As an additional coordination mechanism, DOE has also created the Critical Materials Collaborative (CMC).[16] The CMC was established in September 2023, from direction in the Energy Act of 2020 and the Bipartisan Infrastructure Law. The mission of the CMC is to accelerate DOE's critical materials applied RDD&D to achieve domestic clean energy manufacturing, climate, and national security goals by building a robust innovation ecosystem; training the critical materials workforce across multiple sectors; enabling industry adoption of novel, cutting-edge technology; and laying the scientific and technological groundwork needed to address emerging challenges.

The CMC serves to help better plan critical minerals and materials RDD&D efforts and ensure DOE's larger interagency coordination through the National Science and Technology Council Critical Minerals Subcommittee. FECM's Office of Resource Sustainability and EERE's Advanced Materials & Manufacturing Technologies Office are co-leading the CMC, while all DOE offices involved in critical minerals and materials RDD&D form a CMC Executive Committee. The aim of the CMC is to integrate critical minerals and materials applied RDD&D across DOE and improve coordination with the rest of the federal government to accelerate the development of transformational technologies that will be foundational to securing critical material supply chains. The CMC will work closely with the interagency to expand project performers' access to the Department's world-class expertise, capabilities, and facilities.

[16] https://www.energy.gov/cmm/critical-materials-collaborative

International Partnerships

The Department is proactively engaging with our international partners on clean energy supply chains. This includes the G7 and the International Energy Agency, where we are working with allies to promote secure and diversified supplies, market transparency, and responsible practices across the supply chain. The Department is also working closely with Australia through the recently signed Australia-United States Climate, Critical Minerals, and Clean Energy Transformation Compact. Canada, Japan, the UK, and the European Union are also key partners in advancing resilient critical material supply chains.

DOE is also leading international efforts to develop sustainability standards for critical minerals in the International Organization for Standardization (ISO). This will help to ensure a level playing field for U.S. manufacturers and to avoid a global race to the bottom as countries increase their reliance on critical minerals to meet their energy transition and net zero goals.

It is important to develop a diverse critical materials supply network to maintain supplies needed by our allies and to keep market prices for critical materials affordable in international and domestic markets. As part of this process, it is important to build capabilities for tracing and verifying the mineral origin for advanced batteries, magnets, and other manufactured products.

Conclusion

Through the President's Invest in America efforts, and with the leadership and partnership of Congress in passing the Inflation Reduction Act and Bipartisan Infrastructure Law, our country is making great strides in reversing decades of underinvestment in U.S. manufacturing and resilient supply chains.

DOE is utilizing the full range of tools the President and the Congress have provided us, including historically large tools such as the nearly $10 billion to boost domestic production of advanced batteries, battery materials, and electrified vehicles, as well as over $16 billion in Loan Program Office conditional commitments.

And we are seeing results. We have leveraged over $157 billion so far in announced private sector investments in new and expanded domestic facilities, translating into 130,000 estimated new jobs with benefits for communities across our country.[17]

But we also know that we have more work to do. DOE greatly appreciates the Senate Energy and Natural Resources Committee for its bipartisan leadership and support of critical materials research, development, and demonstration over many years. And we thank you for your ongoing partnership as we continue our vital work. Thank you.

[17] https://www.energy.gov/invest

The CHAIRMAN. And now we will turn to Secretary Adeyemo.

STATEMENT OF HON. ADEWALE O. ADEYEMO, DEPUTY SECRETARY, U.S. DEPARTMENT OF THE TREASURY

Mr. ADEYEMO. Thank you, Mr. Chairman.

Chairmen Manchin and Wyden, I should say and Ranking Member and members of the Committee, thank you for having me today. I look forward to discussing Treasury's efforts to implement recently passed legislation in ways that help American companies build an effective supply chain to support our transition to a clean energy economy and improving our energy security.

The Inflation Reduction Act and the Infrastructure Investment and Jobs Act jump-started the United States' ability to compete in the global market for electric vehicles. As you know, the People's Republic of China has, for over a decade, pursued non-market policies and practices to further state-led industries targeting, and has channeled enormous amounts of financial support into the development of an EV sector, seeking to help Chinese firms establish a dominant position in the global EV marketplace. China's targeted government intervention and investment in clean energy totaled over $500 billion in 2022 alone, nearly four times the investment in the U.S., and more than 1.5 times the U.S. and European Union investment combined. Today, China produces over half the world's EVs and even a larger share of EV batteries. Critical minerals, as you all know, have been central to China's EV sector development strategy.

While China is ahead of us on EVs today, by enacting the IRA and the Bipartisan Infrastructure package, you have given the United States the ability to not only compete, but to lead an effort to build an alternative global supply chain. Of course, because our domestic system is different than China's, our path to building a resilient domestic EV production base is also going to be different. Instead of directing industries, the IRA and Bipartisan Infrastructure Law provide incentives to support the private sector in building the EV ecosystem from manufacturing and procurement to adoption and charging. Importantly, these incentives foster competition in our economy. Because of the IRA and Bipartisan Infrastructure Law, America's manufacturers are responding. It is why we have seen manufacturing investment for clean vehicles, batteries, and critical minerals double since enactment of these packages.

American workers across the country are witnessing firsthand the new economic opportunities. Since the passage of the IRA, we have seen $157 billion in private-sector investment announcements around EVs and batteries here in the United States, investments in communities all over the country, not just on the West Coast or the East Coast, the middle of the country, and in the South. Across America, we have seen these investments. Investments related to clean energy are being made disproportionately in communities with historically lower wages, lower college graduation rates, and higher rates of poverty. An important distinction between our strategy and China's is that we are not undertaking this transition alone.

While our investments benefit American manufacturers, workers and consumers, we recognize that for this project to be successful, we need our allies to help build resilient supply chains that improve our energy security. That's why our early efforts to build critical mineral agreements have centered on allies with whom we share values and national security interests. We know too well the impact that Russia's weaponization of natural gas has had on Ukraine and on crude oil markets and the price at the pump here in the United States. While gas prices have fallen 35 percent since the peak in 2022, over the long term, it is clear that we need to improve our energy security with clean energy, and we cannot afford for our allies to go from being overly reliant on Russia for natural gas to being reliant on China for batteries. In both instances, we are left vulnerable to weaponization of trade as a geopolitical tool.

That is why building our EV supply chain is critical to our energy security. It will not happen overnight, as you all know, but the investments that have been made in recent months and years will pay dividends for decades to come. In time, these investments will transform into the domestic supply chain that will power numerous electric vehicle models expected over the next decades. A main beneficiary of these investments is the American worker. Manufacturers have already announced nearly 200,000 direct EV-related jobs in the United States over the past eight years. The recently announced EV and electric vehicle battery manufacturing investments are expected to create more than 800,000 additional jobs in the broader economy. We expect growth in manufacturing, instruction, engineering and electrical work, and more. These well-paying jobs will bring new economic opportunities to communities across the country. And as such, the clean energy transition will benefit American consumers, workers, and communities.

In the year ahead, Treasury plans to continue its work to support building out the EV supply chain in a way that benefits American companies, workers, and consumers while also collaborating with our allies. I look forward to discussing the details on how we will do this today with you, and look forward to continuing our partnership with the Department of Energy and our partners in the interagency.

Thank you.

[The prepared statement of Mr. Adeyemo follows:]

United States Department of the Treasury Deputy Secretary Adewale Adeyemo
Opening Statement for the Senate Energy and Natural Resources Committee
"Hearing to Examine Federal Electric Vehicle Incentives Including the Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains"
January 11, 2024

Chairman Manchin, Ranking Member Barrasso, and members of the committee, thank you for having me here today. I look forward to discussing Treasury's efforts to implement recent legislation in ways that help American workers and companies build an effective supply chain to support our transition to clean energy and improve our energy security.

The Inflation Reduction Act (IRA) and the Infrastructure Investment and Jobs Act (IIJA) jumpstarted the United States' ability to compete in the global market for electric vehicles (EVs). As you know, the People's Republic of China (China) has, for over a decade, pursued non-market policies and practices to further state-led industrial targeting and channeled enormous amounts of financial support into developing its EV sector, seeking to help Chinese firms establish a dominant position in the global EV market. China's targeted government intervention and investments in clean energy totaled over $500 billion in 2022 alone, nearly four times the investment in the U.S. and more than 1.5 times the U.S. and European Union combined.[1] Today, China produces over half the world's EVs and an even larger share of EV batteries.[2]

Critical minerals have been central to China's EV sector development strategy. As of 2022, Chinese mines accounted for 65 percent of global production of graphite and 70 percent of rare earths.[3] China's refiners have 77 percent of global cobalt refining capacity and more than half of global lithium refining capacity.[4] China produces 84 percent of anode battery components, 68 percent of cathode components, and 77 percent of battery cells globally.[5]

While China is ahead of us on EVs today, by enacting the IRA and IIJA, you have given the United States the ability to not only compete but to lead an effort to build an alternative global supply chain. Of course, because our domestic system is different from China's, our path to building a resilient domestic EV production base is also different. Instead of directing industry, the IRA and IIJA provide incentives that support the private sector in building the EV ecosystem, from manufacturing and procurement to adoption and charging. Importantly, these incentives foster competition.

Because of the IRA and IIJA, American manufacturers are responding. It's why we've seen manufacturing investment for clean vehicles, batteries, and critical minerals double since enactment. American workers across the country are witnessing firsthand the new economic

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[1] https://www.scientificamerican.com/article/china-invests-546-billion-in-clean-energy-far-surpassing-the-u-s/
[2] https://www.bruegel.org/newsletter/following-boom-chinas-electric-vehicle-industry-now-faces-weak-domestic-demand-and
[3] https://pubs.usgs.gov/periodicals/mcs2023/mcs2023.pdf
[4] https://www.instituteforenergyresearch.org/international-issues/china-expected-to-increase-control-over-global-lithium-and-cobalt-supply/
[5] https://www.cfr.org/blog/ford-catl-partnership-illustrates-challenge-decoupling-ev-supply-chains

opportunities. Since the passage of the IRA, we've seen $157 billion in private sector investment announced for EVs and batteries.[6] Investments related to clean energy are being made disproportionately in communities with historically lower wages, lower college graduation rates, and higher poverty.[7]

An important distinction between our strategy and China's is that we are not undertaking this transition alone. While our investments benefit American manufacturers, workers, and consumers, we recognize that for this project to be successful, we need our allies to help build resilient supply chains that improve our energy security. That's why our early efforts to build critical mineral agreements have centered on allies with whom we share values and national security interests.

We know too well the impact that Russia's weaponization of natural gas had on Europe's economy, but we also saw the impact that Russia's further invasion of Ukraine had on crude oil markets and the price at the pump here in the United States. While gas prices have fallen 35 percent since their peak in 2022, over the long term, it's clear that we need to improve our energy security with clean energy. And we cannot afford for our allies to go from being overly reliant on Russia for natural gas to being reliant on China for batteries. In both instances, we are left vulnerable to the weaponization of trade as a geopolitical tool.

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A main beneficiary of these investments is the American worker. Manufacturers have announced nearly 200,000 direct EV-related jobs in the United States over the past eight years. The recently announced EV and EV battery manufacturing investments are expected to create more than 800,000 additional jobs in the broader economy.[9] We expect growth in manufacturing and construction, engineering and electrical work, and more. These well-paying jobs will bring new economic opportunity to communities across the country, and as such, the clean energy transition will benefit American consumers, workers, and communities.

In the year ahead, Treasury plans to continue its work, to support building out the EV supply chain in a way that benefits American companies, workers, and consumers, while also collaborating with our allies. I look forward to discussing the details on how we'll do that with

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[6] https://www.whitehouse.gov/invest/
[7] https://home.treasury.gov/news/featured-stories/the-inflation-reduction-act-and-us-business-investment
[8] Charging into the future: the transition to electric vehicles available at https://www.bls.gov/opub/btn/volume-12/charging-into-the-future-the-transition-to-electric-vehicles.htm
[9] One Year After IRA Passage, New Report Finds U.S. Electric Vehicle Investments, Jobs Continue to Soar available at https://www.edf.org/media/one-year-after-ira-passage-new-report-finds-us-electric-vehicle-investments-jobs-continue

you here today, and I look forward to continuing to work together with you in the weeks and months to come.

The CHAIRMAN. Thank you, Mr. Adeyemo.

And now, we are going to start our questioning, and I will begin. Do you have a quick question?

Senator WYDEN. If that would be all right. I know that you——

The CHAIRMAN. I know you have to go to the committee, right?

Senator WYDEN. We are working on this tax agreement.

The CHAIRMAN. Go ahead. Ask your question.

Senator WYDEN. Thanks so much. I have just one, and I want to thank the Chairman and Senator Heinrich on this.

Mr. Secretary, it has been a pleasure to work with you and Mr. Turk. We have seen the major automakers already making changes in their supply chains to ensure vehicles qualify for the new Clean Vehicle Tax Credit. And this, in our view, is in response to the supply chain requirements that were in the IRA. My one question to you is, can you tell us how Treasury's rules help to implement the statute's provision here so that we can make sure that the new Clean Vehicle Tax Credit helps us with supply chains, helps us with climate, helps us with jobs? How do the rules you are working on help to implement the statute that we wrote?

Secretary Adeyemo.

Mr. ADEYEMO. Yes, Senator, thank you for the question and thank you for your leadership in drafting the IRA. What we have seen in our conversations with automakers is that they feel as if the standards set in the IRA in terms of clean vehicles and the 30D standards are tough. And that's why we have seen, as we introduce the Foreign Entity of Concern Rule, that it went from over 40 cars being eligible to only 13. What the automakers have also said is that they are achievable standards that we can use to make sure that they are domesticating the supply chain. And by making sure that any car that receives the 30D credit has to be built here in North America, it means that it is going to be built within our economy, we are building supply chain here.

And in addition to 30D, 45X and a number of the other credits will mean that not only are the cars built here, but the batteries will also be built here in America using American innovation and ingenuity—American workers. American manufacturing has led the world for decades, and because of the way that you designed the IRA, it has put us in a position where we create incentives, both for American consumers who want to buy EVs, but also for American manufacturers, including auto manufacturers to be able to compete with China by lowering the cost of the supply chain that they will need to do so. Over the last year alone, the automakers have talked about the work that they are doing to bring that supply chain back to America and to our FTA partners. And because of the work that we are doing alongside our colleagues, the Department of Energy, we are making that easier every day.

Senator WYDEN. Thank you.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

We will get back to our regular schedule here.

Mr. Adeyemo, I am deeply concerned that Treasury is allowing taxpayers to claim Inflation Reduction Act credits in the current tax year based on proposed rules and not final rules. I cannot think of any other federal agency that operates this way. And here is my

comparison: if FERC proposes a policy change or EPA proposes a regulation or DOE proposes a grant program, only once the proposal is final does it actually come into effect. So do you agree it is abnormal to rely on proposed rules for programs that are already in effect, like the IRA tax credits, and is Treasury using proposed rules to avoid legal challenges?

Mr. ADEYEMO. Senator, thank you for the question.

And no, it is normal for us to that when it comes to the tax code. You are sitting next to Chairman Wyden, who works with us on a regular basis on tax issues that are similar to this one, and outside of the IRA context, whenever you have a tax policy, we often will propose rules and allow taxpayers to rely on those proposed rules while we collect comments and finalize those rules——

The CHAIRMAN. I hate to interrupt you, sir. If you can just—what period of time do you consider proposed rules before acting on permanent rules? Right now, you are proposing until 2027 and beyond. We have never seen anything like this.

Mr. ADEYEMO. Senator, we have a proposed rule out there for comment. And what we have asked for is that stakeholders like you provide us with comments that will then put us in a position to revise and provide a final rule as soon as possible. Our goal is to try and finalize these rules as quickly as possible to give taxpayers as much certainty as possible.

The CHAIRMAN. You can understand our concerns on this because you filed for 2026-2027. Taking two or three years to get input before you make a final rule is going to put an awful lot of people who are making investments in our country in jeopardy if they base it off the way the bill was written. That is my concern, sir. And we have talked about this. We can go into more detail.

I want to go to Mr. Turk right now. Some U.S. automakers and producers have said there is just no way that we can make these EV batteries without China. And it makes no sense to me at all, since most of this technology started here in America, and then was taken to China and other foreign countries of concern. So do you agree with some automakers that it's okay for U.S. tax credits to benefit these countries of concern, such as China, whether it be Russia, whether it be North Korea, whether it be Iran or another such as that we share no values with?

Mr. TURK. So I think we can absolutely do it without China. Just to give you a few numbers, we talked about the fact that graphite, right now, the processing, is 100 percent in China. Just from the investments, the tools that you have given us so far that we have used, right now our projection is that 16 percent of the graphite that will be used in passenger vehicles in the U.S. by 2027 will be U.S. That goes from basically zero to 16 percent just with the investments we have made so far.

The CHAIRMAN. Yes.

Mr. TURK. And we have got a lot more grant funding. We have got a lot more loan——

The CHAIRMAN. Why do you think that the numbers were cut in half, that these numbers were cut in half then? Why do you think they defied the law? Are you trying to accelerate because you think we can't do it quickly enough, so you have to decelerate this to 20 percent or half?

Mr. TURK. Well, I think the way we look at it, and we work incredibly closely with our Treasury colleagues and other colleagues across the interagency, it is the tax incentives, but it is also the grant funding through the Bipartisan Infrastructure legislation. It's our loan program. The Defense Department has some funding as well to help on critical minerals that they are using for a graphite mine in Alaska right now. So it's all of these tools together trying to get our percentages up as quickly as we can, understanding, as you mentioned in your opening and I mentioned in my opening, we have not had an active policy——

The CHAIRMAN. Right.

Mr. TURK [continuing]. Or tools in our tool belt to do anything about this——

The CHAIRMAN. Let me say one more thing on this if I can. My problem is this: The people that are making the investments think this is what they have to hit, knowing now where foreign competition can come in unfairly and undercut them. That's where I think the lawsuits are going to come in and it's going to be horrendous for us to be able to fight this and the uncertainty.

Let me switch to something else. I have spoken to you both numerous times about the concerns about misclassification of certain battery component production as critical minerals processing rather than manufacturing. The difference between sourcing and processing versus manufacturing is very clear. We wrote it very clear in the bill, so my question would be, why is there a discrepancy between the two definitions?

Whoever wants to speak up——

Mr. ADEYEMO. I will start. I think what we did was we worked very closely with our partners at DOE to develop the definition, and we borrowed, in large part, from the definition that was in the Bipartisan Infrastructure Law for several reasons, one being that we wanted to provide as much certainty as possible.

The CHAIRMAN. We wrote in—I am so sorry, Mr. Adeyemo—we wrote specifically what the definition was in the bill, not the Bipartisan Infrastructure bill, but in the IRA. And you all went back and used the language to solidify what you wanted to do, how you wanted to do it, or how you wanted to let them morph together. Sourcing and processing are completely different than manufacturing. Okay? And manufacturing is supposed to be in North America—$3,750 for one, $3,750 for the other. That's the problem.

Mr. ADEYEMO. Well, Senator, as I mentioned earlier, what we have done is, we put out a proposed rule. Our goal is to take feedback from you and other stakeholders on that proposed rule. What I am trying to explain is why we went with the proposal that we did, and our goal was to provide certainty to the marketplace by trying to make sure that we provided them with one definition of processing and manufacturing that was similar. We worked closely with our partners at DOE to develop that. We look forward to taking your feedback and feedback from other stakeholders as we move from a proposed rule to a final rule.

The CHAIRMAN. Well, we are going to continue to work together to try to get back to the definition written into the bill and it not having it being interpreted differently.

With that, we will turn to Senator Barrasso.

Senator BARRASSO. Thanks, Mr. Chairman.

Mr. Adeyemo, let me just continue. You know, I understand that under the IRA, leased electric cars—and the Chairman agreed with me when I mentioned this earlier—are not subject to foreign source content requirements, to consumer income limits, or to vehicle price limits—leased cars, is that correct?

Mr. ADEYEMO. So leased vehicles are treated differently than purchased vehicles, Senator.

Senator BARRASSO. So I am correct. All right. So that means that somebody making over a million dollars a year, under this Administration, in your plan, could lease a $100,000 electric car that contains lots of minerals from China and still benefit from a $7,500 tax credit. Do you believe that is a good use of taxpayer money?

Mr. ADEYEMO. Senator, that's not true over time. The way that the provision works for 45W is that it will come down as the cost of the vehicle comes down making it——

Senator BARRASSO. But it's true today. I don't want to hear that it's not true over time. Today it's true, is that right? $100,000 car, somebody making a million dollars a year still gets the tax credit?

Mr. ADEYEMO. Today, the leased vehicle credit is the same as the 30D credit. But Senator, what I was trying to explain was that the way that the bill was designed was to make the purchase credit more valuable in order to incentivize the domestication of the supply chain. That's why we are seeing the movement of the supply chain back to the United States and our allies, because over time our car companies, like Ford and GM, know that they are going to be——

Senator BARRASSO. Well, the Chairman of the Committee has made clear that the way the bill is designed and the way that it is being implemented are very different right now, and this is one of these abusive areas that I think the American people say, hey, we are subsidizing very rich people, who are liberal, who have these elitist views on the West Coast, they are getting big payoffs because they are into this kind of thing, when these cars don't work other places.

Mr. Turk, you testified before the Committee in February 2023. At the time, the Chairman and I both raised concerns about the Department's grant negotiations with Microvast, a China-based battery company. In response, the Department did its homework and canceled its award negotiations with Microvast. It appears that the Department has again failed to do its homework, or even a quick Google search, for that matter, when last September the Department finalized a $3 billion loan guarantee with Sunnova, a solar company. At the time, Sunnova had an F rating—an F rating. Mr. Turk, this is the F rating, Better Business Bureau, Sunnova, $3 billion grant from the Department. The Better Business Bureau actually has stripped Sunnova of its accreditation. They are still not accredited. In 2019, Sunnova was found to be operating illegally after not fulfilling its duties to customers under Puerto Rican law.

[Poster documenting Sunnova's Better Business Bureau rating follows:]

September 27, 2023

Better Business Bureau

Not BBB Accredited

Business Profile

Sunnova Energy Corporation

Solar Energy Design

BBB Rating & Accreditation THIS BUSINESS IS NOT BBB ACCREDITED

F

Alert: Sunnova Energy Corporation has stated in media, "We are working closely with the BBB to have our accreditation reinstated." However, the BBB is not able to work with Sunnova Energy Corporation at this time to have accreditation reinstated as the business currently does not meet the BBB's Standards for Accreditation

https://web.archive.org/web/20230927161235/https://www.bbb.org/us/tx/houston/profile/solar-energy-design/sunnova-energy-corporation-0915-90035524

Senator BARRASSO. According to media reports, a Sunnova salesman sold an elderly man a $60,000 solar system after the man told the salesman that he was in hospice and dying. That's how you get an F rating. The elderly man died soon after. Sunnova then, what did they do? Well, they placed a lien on his mobile home, which prevented his family from selling the property. A Texas woman said that her 80-year-old mother was blind, bed-bound, partially deaf, on dialysis, with congestive heart failure. So what did Sunnova do? Oh, they sold that elderly woman a 25-year, $86,000 contract. That's how you get an F rating. The mother died three months later. These are but a small fraction of the deeply troubling complaints against this company, Sunnova. A company that the Department of Energy has granted a $3 billion loan guarantee to.

Can I have your commitment that the Department will go back, do its homework, and reconsider this flawed decision to award Sunnova a $3 billion loan guarantee?

Mr. TURK. Well, thank you, Senator, for the question. Let me just say, we are continuing to do our homework and make sure that we have improvements throughout our processes. You mentioned Microvast. We have put in place and we are improving and strengthening what we call our RTES, our Research, Technology and Economic Security effort, to take advantage of public information, intelligence information, and expertise that we have at our Department and in our labs, to make sure that we are doing the scrutiny that the public, the taxpayers, deserve and demand. So we are continuing to improve that process.

This is a program under our loan program. This is a conditional commitment right now. And so, we are continuing to do our due diligence, continuing to do our homework. We are looking for ways to make sure that solar PV technology is accessible to everyone, including low-income folks, and that's what this loan is about. And we are using the leverage of this loan, all our due diligence, to make improvements to make sure that we have the highest standards going forward. So that is the process we are in right now with Sunnova, with these discussions and the conditional commitment.

Senator BARRASSO. Well, it has been a finalized $3 billion loan guarantee already. I think you did the right thing with Microvast, pulling back. It should have been done beforehand. You shouldn't need a Committee here, and a Chairman and a Ranking Member pointing out how bad this company is before the Administration goes back and says, well, maybe we shouldn't give them the $3 billion.

Thank you, Mr. Chairman. I have additional questions for a later time.

The CHAIRMAN. Absolutely, Senator.

Senator Heinrich.

Senator HEINRICH. Thank you, Chairman.

Secretary Adeyemo, as Congress intended, the Inflation Reduction Act incentives are dramatically accelerating the ongoing clean energy industrial revolution, I will call it, and really supercharging manufacturing in a way that we haven't seen in 60 years. You shouldn't take my word for that, but I would ask unanimous consent to put a couple of articles in the record today. One from Forbes that says in 2023, and this is the headline, "The United

States Started Building Big Again, Thanks to Biden's Inflation Reduction Act." And another from Axios, where the headline is, "A Manufacturing Investment Supercycle is Starting."

[The articles referred to follow:]

Forbes

FORBES > BUSINESS > ENERGY

In 2023, The United States Started Building Big Again, Thanks To Biden's Inflation Reduction Act

Energy Innovation: Policy and Technology
Contributor
We are a nonpartisan climate and clean energy policy think tank.

Dec 26, 2023, 08:15am EST

By Jack Conness, Policy Analyst, Energy Innovation

2023 was a tumultuous year for the United States economy. Consumers dealt with pain points from inflation and high gas prices to increased interest rates. Despite these headwinds, the country's clean energy economy surged thanks to President Biden's Inflation Reduction Act (IRA) and growing demand for clean energy technologies, which added nearly $100 billion in new investment and more than 80,000 new jobs.

The IRA was the largest-ever investment in U.S. climate, clean energy, electrification, and energy efficiency. Combined with the CHIPS Act, Bipartisan Infrastructure Act, and other federal actions, the IRA is supercharging the economy. Onshoring U.S. jobs supporting the domestic manufacturing of electric vehicles

(EVs), batteries, solar panels, wind turbines, heat pumps, and other clean energy technologies is jumpstarting a new clean industrial revolution.

To monitor the changes catalyzed by the IRA, I created the IRA Dashboard tool to track activities across every state. Since August 2022, when the IRA was signed into law, 142 projects have been announced totaling $98 billion in investment dollars and more than 80,000 jobs – including nearly $60 billion and 50,000 jobs in 2023.

States like Georgia and North Carolina have led the pack, attracting $15.4 billion and $13.7 billion in invested, respectively.

Michigan and South Carolina have both secured more than 10,000 new clean energy and electrification manufacturing jobs. Arizona, Nevada, Indiana, Illinois, Louisiana, and New Mexico – in addition to previously mentioned states – each attracted $1 billion investment in 2023.

These emerging trends highlight that the clean energy space is an economic bright spot poised to grow in the years ahead.

Just two weeks after the IRA was signed into law, announcements from major automakers and battery companies accelerated, with new EV and battery manufacturing facilities making up nearly 90% percent of the total $98 billion dollars invested (19 out of the top 20 largest investments are going to batteries and EVs).

Toyota, Hyundai, Honda, Tesla, Stellantis, General Motors (GM), Ford, and Scout Motors have all made billion-plus dollar investments into American-made batteries and/or EV assembly since the IRA passed.

This year, after announcing they were re-evaluating their investment in June 2022, LG Energy Solution (LGES) nearly quadrupled their initial $1.4 billion investment into an Arizona battery plant and committed $5.5 billion in March 2023 - at the time, the largest investment for a single American battery manufacturing facility, later passed by Toyota's North Carolina battery plant).

LGES stated: "The company's decision to increase investment in cylindrical EV battery production in North America comes from rising demand from EV makers for locally manufactured high-quality, high-performance batteries in an effort to satisfy the Inflation Reduction Act's EV tax credits".

In Nevada, Tesla announced in January 2023 that they were investing $3.6 billion into their growing Gigafactory Nevada, adding 3,000 new jobs – one month after Redwood Materials committed $1.1 billion and 701 jobs to an expanded Storey County facility. "The Inflation Reduction Act has really accelerated even what was already a fast process of a lot of companies locating or expanding battery production in the U.S", said J.B. Straubel, co-founder and CEO at Redwood Materials.

Stellantis resurrected a shuttered assembly plant in Belvidere, Illinois at the beginning of 2023. With help from the IRA, state and local leaders, and the United Auto Workers (UAW), Stellantis reopened the assembly plant, committing over $3 billion to a new battery plant and rehiring many previously laid off workers.

Midwest Manufacturing Roars Back to Life and Pivots to Electrified Transportation

The IRA is also revitalizing the Midwest's auto industry, bringing jobs and investments to Michigan, Ohio, Illinois, and Indiana. Michigan has added the second-most jobs since IRA passed (10,685), while Ohio has added the fourth-most (5,785) – both ranking in the top-eight in total investment.

Illinois landed the aforementioned Stellantis investment and $2 billion from battery manufacturer Gotion in Manteno, which will create 2,600 jobs. Between the two facilities and a few smaller announced investments, Illinois will see a total of $5.25 billion dollars in new investments and over 4,000 jobs created.

Indiana attracted two multi-billion investments to their state: A $3 billion joint venture from GM and Samsung SDI in New Carlisle and a $3.2 billion joint venture from Stellantis and Samsung SDI. Most recently, an $800 million investment from Canadian Solar in October will be coming to Jeffersonville – creating 1,200 jobs. Statewide investments from 2023 totaled up to $7.2 billion and 4,500 jobs.

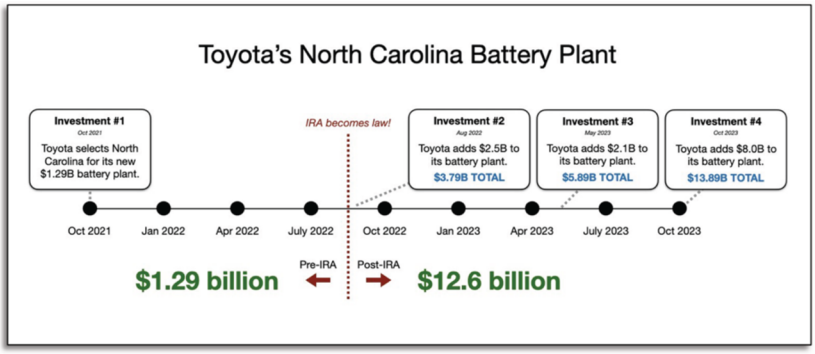
Collectively, these four states compose 30% of all investment dollars and 25,000 of the jobs created in investments tracked since the IRA passed. Traditionally the hub for auto manufacturers in America's history, these states and companies are taking the on-ramp to an electrified future.

The Southeast Battery Belt is Thriving, Thanks to the Inflation Reduction Act

The Southeast U.S. is also experiencing an economic revival centered in North Carolina, South Carolina, and Georgia – thanks to the IRA.

Georgia now boasts four multi-billion dollar investments from Hyundai / SK ($5 billion), Freyr Battery ($2.6 billion), Hanwha Qcells ($2.5 billion), and Hyundai/LG Energy Solution ($2 billion more added this year). South Carolina welcomed two multi-billion investments in 2023: a $2 billion investment from Scout Motors in Blythewood and a $1.3 billion investment from battery manufacturer Albemarle in Chester County.

And, after an initial $1.29 billion investment into a North Carolina battery plant in 2021 before the IRA's passage, Toyota has since announced three more investments. In October 2023, they announced an additional $8 billion that will go towards the battery plant, bringing the total investment to nearly $14 billion and the creation of over 5,000 jobs for U.S. autoworkers.



Toyota has announced $14 billion in total investment to its Liberty, North Carolina battery plant JACK CONNESS

Among all states, these three rank highest in terms of total new investment dollars ($40.7 billion) and towards the top in terms of IRA-related jobs: Georgia leads the way with over 13,000 new manufacturing jobs, South Carolina ranks third with over 10,000 jobs, and North Carolina ranks sixth with over 4,000 jobs.

State Leaders and Policies Are Competing for IRA-Supported Investments

While the IRA has clearly attracted new investment to states, elected officials and state policies have played an integral role in the success rates among those chosen for IRA-supported investments.

Governor Brian Kemp (R-GA) stated he "intends for Georgia to be recognized as the electric mobility capital of America." In a showing of bipartisan collaboration, Governor Kemp and Senator Jon Ossoff (D-GA) have successfully recruiting businesses to their state, including multiple international trips that helped land major Hyundai investments. These efforts have been bolstered by a workforce program, called Georgia Quick Start, that helps

support workforce training and recruitment efforts for new EV, battery, and solar manufacturing plants.

Governor Gretchen Whitmer (D-MI) created the Office of Future Mobility and Electrification to make Michigan more attractive to investments and support the future workforce for transportation electrification. Similarly, Governor McMaster (R-SC) signed an executive order supporting the state's aim to recruit EV business and prepare its workforce for these jobs.

The Clean Energy Economy is Here to Stay, But Now is the Time to Double Down

Perhaps the most notable trend of 2023 is that America is building things again – specifically, the technologies and components that will help us electrify our transportation sector and provide clean energy for the grid. Thanks to the IRA and other federal policies, the U.S. is finally attracting the manufacturing capabilities to support a domestic supply chain that is more resilient, reliable, and beneficial for American consumers.

These bright spots are a glimpse into our future. The U.S. just eclipsed one million EVs sold in 2023 – a first in the country's history – and demand continues growing for batteries, solar panels, wind turbines, heat pumps, and other clean technologies.

Now it's time to double down. States that adopt favorable policies, build strong workforce programs, and capitalize on new federal grant programs can tap billions in IRA-spurred investment. These leading states show, doing so will attract economic development opportunities, high-paying jobs, and secure the domestic clean energy economy.

AXIOS

Jun 16, 2023 - Economy

A manufacturing investment supercycle is starting

Neil Irwin

A semiconductor plant under construction in Arizona. Photo: Caitlin O'Hara/Bloomberg via Getty Images

It's easy to get so caught up in month-to-month economic data that you miss a longer-term trend emerging before your eyes.

A manufacturing investment supercycle is starting

- Here's one: There is massive new investment taking place in U.S. heavy industry that's set to shape the economic landscape for years to come.

Why it matters: The 2010s were a period of chronic underinvestment. By contrast, now there are billions flooding into large, expensive megaprojects to manufacture batteries, solar cells, semiconductors and much more.

- It is fueled by hundreds of billions of dollars allocated by the Biden administration's signature legislation — the Inflation Reduction Act, Bipartisan Infrastucture Law, and CHIPS and Science Act — as well as pent-up demand.

- It implies sustained upward pressure on demand for workers and raw materials for years to come, and makes a recession less likely by creating a floor of activity under normally volatile industries.

What they're saying: "We believe the U.S. is in the early stages of a manufacturing supercycle," wrote Joseph P. Quinlan, head of CIO Market Strategy at Merrill and Bank of America Private Bank, in a report this week.

- He emphasizes the role of foreign direct investment in the surge, as global companies rush to build large-scale facilities in the United States. He sees the trend extending well into the second half of the 2020s.

- "It's really gotten the attention of the world," Quinlan tells Axios. "When you talk to companies in South Korea, Japan, Europe, all they want to talk about is building out a presence in the U.S."

By the numbers: As of April, spending on manufacturing construction — new factories — is tracking at a $189 billion annual rate, triple the average rate in the 2010s ($63 billion).

A manufacturing investment supercycle is starting

Manufacturing construction spending

Seasonally adjusted annual rate; Monthly; January 2002 to April 2023

Data: Census Bureau; Chart: Axios Visuals

- That helps explain some of the underlying strength in the U.S. economy even amid elevated recession fears. For example, the construction sector has added 192,000 jobs over the last year, despite higher rates hammering the housing sector.

Between the lines: The types of investment taking place in this boom tend to involve much larger capital outlays than were seen in the 2010s. For example, two European companies announced this month they will invest $2 billion in Texas for a plant to make synthetic natural gas.

- Higher rates of private investment, combined with large U.S. budget deficits, could keep interest rates higher than was the pre-

pandemic norm.

- Moreover, these industrial facilities tend to create high-wage jobs, which could put sustained upward pressure on wages across the economy. That's good for workers, less good for the inflation outlook.

The bottom line: Understanding how this manufacturing boom plays out —how big and how long-lasting it turns out to be — will be crucial for understanding the macroeconomy of the remainder of the 2020s.

Senator HEINRICH. We have seen this in New Mexico with three different factory announcements in solar, in wind, and in electric vehicle supply chains. And so we have already seen hundreds of thousands of jobs created in making batteries, solar panels, heat pumps, and other clean energy technologies here in the United States. So how would you characterize the manufacturing investment landscape both before and after the passage of the Inflation Reduction Act?

Mr. ADEYEMO. Well, Senator, thank you for the question. Thank you for your leadership with regard to the Inflation Reduction Act. And I think that you have done a good job of characterizing the sea change that we have seen in America due to what I would say are the three historic pieces of legislation that Congress has passed—the CHIPS and Science Act, the Bipartisan Infrastructure Law, and most importantly, the Inflation Reduction Act. And what it has done is, it has led to investment in America that is unlocking a manufacturing boom that spreads throughout the country, not only in your state, but throughout the country in a way that is, in lots of ways, giving people access to jobs that are well-paying jobs to build the economy of the future and not just an economy that is going to matter here in America, but one that will allow America to be a leader around the world. Because ultimately, what we have learned over the last few years is the importance of supply chains. And the investments we are making and building the supply chain that goes through America will both supply key goods and clean energy to America, improving our energy security, but it will also mean that America is at the center of the alternative supply chain to China that our allies and partners can rely on. These investments will unlock our ability to make sure that America's economy doesn't just grow next year, but over the next decades, and that is because of the passage of legislation like the Inflation Reduction Act.

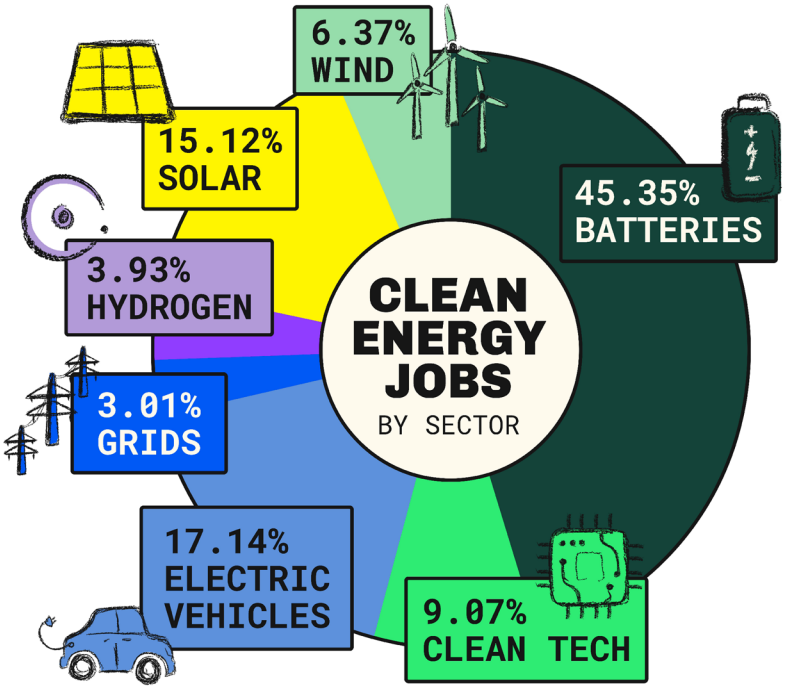
Senator HEINRICH. So when I was growing up, my mother worked in auto manufacturing. She worked at a wheel manufacturing plant. And I saw for years how policies and lack of policies really created enormous disinvestment in the United States. Auto manufacturing declined. And now we are seeing this incredible resurgence. The numbers are absolutely remarkable. The amount of investment here in the United States is remarkable.

[Displayed charts follow:]

211,350

CLEAN ENERGY JOBS

SINCE PASSAGE OF THE BIPARTISAN INFRASTRUCTURE LAW AND INFLATION REDUCTION ACT



DATA: **CLIMATE POWER**

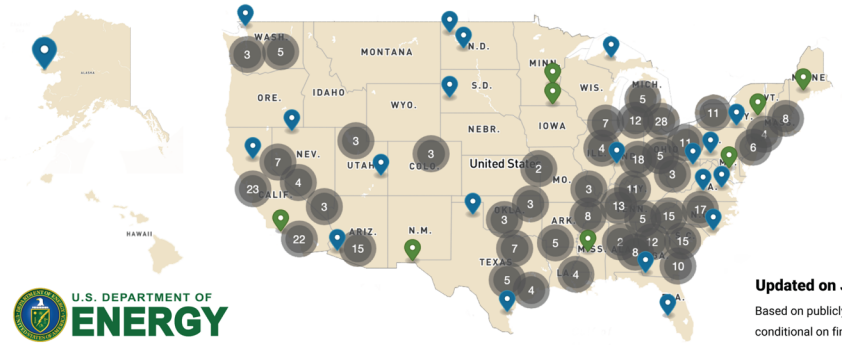
Building America's Clean Energy Future

BATTERIES

- Over $120 billion announced so far
- Announced battery cell factories could supply 10 million new electric vehicles each year
- Over 80,000 potential new jobs
- Over 200 new or expanded minerals, materials processing and manufacturing facilities

EVs, Component Parts, & Chargers

- Over $35 billion announced so far
- Announced production over 1,000,000 charging stations each year, with 60,000 fast chargers
- Over 50,000 potential new jobs
- Over 140 new or expanded minerals, materials processing and manufacturing facilities



U.S. DEPARTMENT OF ENERGY

Updated on January 10, 2024

Based on publicly available information. Many facilities are conditional on financing, funding, site control, and other factors.

Senator HEINRICH. When you just look at the State of New Mexico, I can think of a 1,500 person announcement of a new solar manufacturing plant that is coming, a wind tower manufacturing plant that is getting up off the ground that is roughly 300 jobs, roughly the same size jobs at an auto manufacturing supplier for EVs. What happens to those factories, and more importantly, the people who are going to work in those factories, if we do what House Republicans have suggested and we repeal the Inflation Reduction Act?

Mr. ADEYEMO. So Senator, what happens is, those jobs go away. America's manufacturing boom goes away. The investments that are being made in America would go away if we were to repeal the Inflation Reduction Act. Not only does that happen, but it sets us back in not only meeting our climate goals, but improving our energy security. One of the most important things that was done in the Inflation Reduction Act was the passage of the prevailing wage and apprenticeship provision, which means that not only are we seeing a manufacturing boom in America, but the people who are helping to build those manufacturing plants are being paid a living wage because of the legislation that you have passed. So it is not only creating new jobs, it is creating well-paying jobs all over the country, which are going to be critical to making sure that Americans in communities all over the country have the ability to build opportunities for their family. And if you were to repeal the Inflation Reduction Act, it would have a significant impact on those communities, on those individuals, and on our long-term economic success.

Senator HEINRICH. Secretary Turk, so if those jobs go away, does that make us more or less competitive with China?

Mr. TURK. Absolutely less competitive. We are competing, and I would say we are winning. I know in meetings I have with international counterparts, they are incredibly jealous——

Senator HEINRICH. Yes.

Mr. TURK [continuing]. Of the tools we have in the tool belt, the private sector investment, in particular.

We are not doing industrial strategy like other countries, we are doing it in a uniquely U.S. way with entrepreneurs and companies leading the way. What we are able to do with these tools that you have given us—the tax tools, the grant tools, the loan tools—is accelerate that and have this all across our country in a very intentional way.

Senator HEINRICH. Mr. Chairman, I like winning. Let's do more.

The CHAIRMAN. Let me just say for clarity—the bill that we put together, and the reason I have so many problems with it, and it looks like I am working with both sides, but the bottom line is that we put a bill together with Republican input for over five years that I have been talking and working with them. Because of reconciliation, they weren't able to vote for it. But we don't have to divide us any further by implementing something that we didn't pass, whether they voted for it or not. And our Republican colleagues are benefiting too, but they are as upset as I am that we are not following it.

This is a great bill, absolutely, make no bones about it. And we are all going to benefit from it. All we are asking for, Deputy Sec-

retary Adeyemo, and to you, Deputy Secretary Turk, is to make sure we stay within the confines of how the bill was written, and don't bust the budget to where we are spending twice as much than we appropriated. The CBO score was $680 billion, $690 billion, okay? That should stop when we hit that, and we have done some good things. Let's go back and reappropriate. That is the way it should have been done. And that is what we are concerned about.

With that, we will go to Senator Lee.

Senator LEE. Thanks, Mr. Chairman, and thanks to our witnesses.

Mr. Turk, I would like to start with you. Last spring, we, as a Committee, heard from the CEO of North American Electric Reliability Corporation. This, of course, is the grid reliability watchdog. And we heard testimony that the U.S. faces a looming reliability crisis because of the premature retirement of coal-fired power plants. That message was pretty loud and clear, as I heard it. And we heard the exact same message from the FERC Commissioners. And as my time is somewhat limited, I would appreciate here if you could give me a yes or no answer on this. Is our current grid infrastructure capable of supporting a massive increase in EV usage?

Mr. TURK. So that's why we are making investments in our grid to improve it and make sure we have got the grid that we Americans deserve.

Senator LEE. So it's not, and we need to get there.

Mr. TURK. So I am quite confident with the tools that we have and building out, we are talking about EVs at this hearing. The fact that we are going to have a whole bunch more batteries out there——

Senator LEE. Right.

Mr. TURK [continuing]. That we can determine when those batteries are charged, and especially if we get to bidirectional charge, that is actually going to be a more resilient grid if we incorporate that.

Senator LEE. Now, California has a new regulation carrying the force of law in that state that by 2035 it is going to require 100 percent of new vehicles sold to be electric—all of them—every single one of them. So under that rule, electricity demand is obviously going to skyrocket. One of Utah's largest coal plants, the IPP plant in Delta, currently sends about 80 percent of its generated power to California utilities. Sadly, that plant will soon be retired due to California's zero-coal agenda. It seems that aside from coal and gas, there are currently no affordable, dispatchable, reliable alternatives to support the increased power demand from EVs at scale. Would you agree with that?

Mr. TURK. So I would not. We are making investments, including through the incentives of the Bipartisan Infrastructure legislation, the Inflation Reduction Act, on battery storage and other storage options. We are focusing and doing an awful lot of research and development, demonstration, and deployment on long-term storage. And I think an area that has not gotten as much attention is virtual power plants and smart demand response. We put out what we call a liftoff report, looking at how we get to balance the grids in an efficient, cost-effective way and a reliable way going forward.

And a lot of that comes from balancing supply and demand, taking advantage of technologies, including all these new mobile batteries that are out there that will be out there in even greater scale as we get more EVs. That could be a grid enhancement opportunity if we do it right. And that's what we are working on.

Senator LEE. Well, you don't disagree that we are losing reliable sources of affordable baseload power. We are not adding to the supply of reliable, consistent baseload power at the same rate, even as we are putting a lot more demands on the grid as we provide these incentives, and in some cases—most acutely in the case of California—the mandate about 100 percent electric vehicles by 2035.

Mr. TURK. There is no doubt our electricity sector is changing. We are investing in a whole range of technologies, including in geothermal. If we can get enhanced geothermal at scale and at cost, that can be a huge part of our solution on generation. Small modular reactors on the nuclear side can be a part of it. Balancing the grid with supply and demand using these technologies, it is all part of the work that we are doing at the Department of Energy to make sure that all Americans have reliable electricity and affordable electricity.

Senator LEE. Look, I love the idea of small modular reactors. Love to see it. We have heard about them for years. Haven't seen deployment of them, but that's going to have to change if we keep heading in this direction. It seems like one of the only new sources that we can rely on as more and more other sources of reliable, affordable baseload power are taken off the grid. But you know, we have got to be concerned about it.

Now, the Biden Administration makes the case for widespread EV adoption, and this is an important function to have if we are going to go in that direction. Now, fossil fuels like coal, gas, and so forth power the mining and transportation of raw materials for electric vehicles, for the manufacturing of the components for electric vehicles, for the transportation of the assembled electric vehicles, for the charging of the battery throughout the life of the electric vehicles, and for the eventual disposal of the electric vehicles. It would be reckless and irresponsible to force Americans to purchase these vehicles—which are significantly more expensive, on average, than their internal combustion engine counterparts—and then leave them without a way of charging them. It would be reckless to do all of that and not take into account the environmental impacts of all of those things.

Do you have data that you track on the total environmental impact of these requirements and of the electric vehicles they produce? I mean, are we actually doing the environment a net favor?

Mr. TURK. So we are a very data-driven, science-oriented department with our national laboratories. And I completely agree with you, we should do a very rigorous environmental assessment of all the technologies. And I think one of the exciting parts of the tools that you all in Congress have given us is that we have got incentives for hydro, we have got incentives for nuclear, including small modular reactors, we have got incentives for carbon capture utilization and storage to clean up existing assets. Transportation right now is our biggest source of greenhouse gas emissions, so we have

to have solutions. We have to take that head-on. And you mentioned the affordability—I think what's going on right now, and it is underappreciated by many, is EVs right now are becoming more and more affordable. Right now, we have got a Chevy Bolt model out there that is under $20,000. That is incredible. J.D. Power, actually, when you compare internal combustion and EVs, models for models, apples to apples, EVs are actually cheaper when you take into account the fueling and the reduction in maintenance costs.

Senator LEE. Right. Look, I am out of time, but these are things we have got to look for. I would love to see an analysis from you of the total environmental impact and of efforts you are taking to make sure that we don't have a significant lag between the added demand on the grid that we are creating and our actual supply of functioning affordable baseload power sources.

Thank you.

The CHAIRMAN. Thank you, Senator.

Senator Padilla.

Senator PADILLA. Thank you, Mr. Chair.

I have great news for everybody this morning, particularly my colleagues on the other side of the aisle who have expressed their concerns regarding our reliance on foreign critical minerals, specifically lithium, not just in today's hearing, but in recent years. Last month, DOE announced the results of the most comprehensive analysis to date quantifying the domestic lithium resources in California's Salton Sea region. This analysis, conducted by Lawrence Berkeley National Laboratory, found that with expected technology advances, the Salton Sea's regional total resources could produce more than 3,400 kilotons of lithium, enough to support over 375 million batteries for electric vehicles. The announcement confirms what we have long known in California—the Salton Sea region has significant potential as a domestic source of the critical minerals needed for these batteries.

Question number one, for Mr. Turk. What is DOE doing to support responsible development at the Salton Sea so that we can begin increasing our domestic supply of lithium?

Mr. TURK. Well, thank you, Senator, for mentioning this phenomenal asset that we have in our country in California, the Salton Sea. The analysis that you mentioned is really groundbreaking. Just to put it in perspective, the 375 million batteries for electric vehicles, the Salton Sea, itself, if we can get the costs to where they need to and make sure that we are doing this right from an environmental justice perspective, that is more than the total number of vehicles currently on U.S. roads, just to give you a sense of scale of this one asset, this one resource that we have.

So we are working across the board throughout the Department of Energy—everything from reducing the cost of the technology to get this brined and make sure it is done in the right way and to make sure that this is available for our domestic processors, our manufacturers, and the whole supply chain going forward. We are using our loan program, where we are using all the tools that we have got in the tool belt, and really appreciate the partnership with you, Senator, to make sure that we are connecting all those dots as quickly as we possibly can for economic benefit but also decarbonization benefit as well.

Senator PADILLA. Let me also ask you, how important is it for this Committee to support and incentivize geothermal energy research and development to not only provide a reliable source of power generation, but also to shore up our domestic supply of lithium and other critical minerals like zinc?

Mr. TURK. So I think geothermal is one of the most exciting technologies and opportunities that we have out there. Most people think of geothermal in the traditional sense of geothermal—if you have got a hot spring nearby, you take advantage of that and you get some benefit from that. What is particularly exciting is something called enhanced geothermal, where you use drilling technology. And we have done an awful lot of drilling in our country and perfected a lot of technologies and reduced those costs. If we can train that drilling technology, and there are companies, and we are doing some things through the Department of Energy focused exactly on this. You drill deeper, you do it cheaply, and then you have electricity production because it is higher temperature coming up.

So if we can get that technology at a cost level, that is 24/7 baseload power in a very environmentally responsible way without the carbon emissions. Incredibly exciting. We have got work to do. That's what we are doing, including through our FORGE facility that is testing some of these technologies in the western part of the United States.

Senator PADILLA. Yes, but if we could pull this off, this would be massive.

Mr. TURK. Huge.

Senator PADILLA. We already have a significant amount of quality geothermal energy, which we refer to in the renewable energy space as "renewable gold." Right?

Mr. TURK. Absolutely.

Senator PADILLA. In my time remaining, I wanted to bring up another topic for the Deputy Secretary. The Administration has laid out a goal of deploying 500,000 chargers by 2030. Effective implementation of Section 30C is critical to realizing this and broader climate goals. While more than half of all Americans say they are at least thinking about buying an EV, the lack of reliable charging infrastructure, particularly in rural areas, remains the number one limitation to the widespread adoption of electric vehicles. If we are able to meet our climate goals, Treasury must provide certainty around Section 30C requirements.

Deputy Secretary Adeyemo, Senator Cortez Masto and I recently wrote a letter to Treasury on this issue. How does Treasury intend to leverage 30C to scale up investment in the decarbonization of the transportation sector?

Mr. ADEYEMO. Senator, getting this right is critical to building out the type of charging stations that will be necessary to support the electric vehicles that are becoming abundant throughout the country. We are committed to getting out guidance to states and local governments in the coming weeks, not months, in order to make sure that people have the information they need to make these investments because we know they are critical to your communities.

To pick up on your question to Deputy Secretary Turk, I recently visited the Torres Martinez Tribe and saw the Salton Sea. And I think one of the things that your question reminds us all of is that some of the investments that could be made through the Inflation Reduction Act can transform communities that have often been left behind and left out for too long. That's why we are encouraged to see that the more than $200 billion of investments that have been made because of the Inflation Reduction Act have been made in communities that tend to be above the national average in terms of poverty and below the national average in terms of college education. But we know that in order for all of this to work, we need to build out an infrastructure, and 30C is critical to that, and we are committed to getting out guidance very soon so your constituents, and constituents all over the country can take advantage of this tax credit.

Senator PADILLA. Thank you very much.

Yes, Salton Sea, Mr. Chair, is probably exhibit A on multi-benefit, whether it is critical materials, water resilience and reliability, public health improvements, and the area of quality job creation. I invite you to come visit. Thank you.

The CHAIRMAN. I would love to do it. I will be there.

Senator Hawley has graciously given up his spot for Senator Cassidy.

Senator CASSIDY. And I thank Senator Hawley. And I want all my colleagues to hear this: Senator Padilla, I will bet you, and I will offer you turtle soup from Commander's Palace, if you get that facility in Salton Sea permitted within two years. I am going to win that bet because part of the problem is we can't get permitting for this sort of activity, and the idea that Californians are going to kill a bunch of desert turtles—if they do, ship them to Commander's and I will make your soup for you. Okay?

[Laughter.]

Senator CASSIDY. But I am going to win that bet, brother.

Senator PADILLA. We will see about that.

Senator CASSIDY. Let us work together on improving that.

And Mr. Turk, I always feel like you are straightforward with us. I appreciate that. You look a little older since you were first sworn in, but that is part of being on the dark side. Listen, since we are talking about the Salton Sea, what about doing a DOE analysis of the Smackover Formation in Louisiana for lithium? It's in Arkansas. Louisiana actually has experience and embraces extraction. And that would be economic development for the same group that Senator Padilla spoke of as well as the Secretary, for those who, frankly, could have some economic development. So I think we have some money in the Bipartisan Infrastructure bill for that. If you all could explore that, that would be fantastic.

Mr. TURK. Happy to talk to you and happy to explore that. I think there are a lot of exciting opportunities out there. One of the things I am most excited about, and thanks for the nice words as well, I do feel older, as my kids remind me of on a daily basis.

[Laughter.]

Mr. TURK. We have got an effort in our Fossil Energy and Carbon Management Office to work on some analysis, do some real research with our labs on the mine of the future. How can we take

all the technology that we have learned over many, many years, apply it to extract responsibly—responsibly in an environmental way and responsibly for the communities in which those mines are located and do it with a smaller footprint? I think it is incredibly exciting, but happy to look into the particular project that you mentioned.

Senator CASSIDY. That's great.

Now, related, not to this Committee, but to what you just said, there is a DOE—and by the way, this will be a little bit off topic, but it is related to what you just said. There is, I am told, a DOE review of LNG export facilities, a decision to unilaterally revise the climate criteria in terms of their approval, looking at life cycle emissions within the U.S., but ignoring the fact that if U.S. LNG replaces coal being burned in China or in Germany, the positive benefits for global emissions are incredible—incredible. Whatever increased life cycle emissions you find here in the U.S. by scrutinizing closely, it is overwhelmingly overwhelmed by replacing coal burning in other countries. Now, you just mentioned being driven by science. Would you agree with the statement I just made?

Mr. TURK. So as you know, Senator, and I know it's off topic, but happy to talk about this and happy to have a further conversation with you on our authorities for liquefied natural gas. It is a public interest determination. And so, we are required by Congress to take into account national security, take into account economic implications, take into account environmental and climate change implications, and we should take into account the full life cycle—the emissions at the front end and the emissions on the back end—and do a really thorough analysis. And that is what we do every time we have an application come in.

Senator CASSIDY. But if the fact that the Department of Energy is unilaterally seeking to revise this, and when arguably it is in favor of our national security to help Europe wean off of Russian gas, it is improving the world's climate condition when we replace coal with natural gas. Natural gas has 50 percent more energy content relative to CO_2 positions without the SO_X and NO_X and particulate matter, and it helps our economy by creating jobs for the American people as well as an overall larger GDP for us all. I am not sure where the impetus comes for this unilateral revision, except that the Administration has had a pattern of doing whatever they can to slow-walk LNG export facilities.

Mr. TURK. So let me say two things. One, we take applications as they come and review them thoroughly, as diligently and quickly as we possibly can. Each application is different. Some are easier. Some are more challenging along those lines.

Senator CASSIDY. Now, that's different than what I am describing. I am describing——

Mr. TURK. Secondly——

Senator CASSIDY. Yes.

Mr. TURK. And then secondly, I think we feel the responsibility for the public interest determination in everything we do to continuously update and improve our analysis to make sure we are taking into account all the factors that you mentioned to make sure we are looking——

Senator CASSIDY. I am about out of time, but I will just say that there is a paralysis by analysis when, quite intuitively, everything I said, and quite demonstratively, everything I just said is absolutely true. The fact that DOE is going to go through a multi-year process of redoing it once more suggests that the paralysis actually is the desired result of the analysis. I actually think you are a very reasonable person. I think this is being driven by the political arm. And that political arm is going to sacrifice U.S. national security, U.S. economic interests for the family and for the country, and climate reductions worldwide.

With that, I yield.

The CHAIRMAN. Senator King.

Senator KING. Thank you, Mr. Chairman.

I think it's important to sort of set the context of this hearing. We are talking about all these various details of these programs, but why are we here? We are here because the overarching crisis is the climate. Just in the last ten days, two massive storms on the East Coast made an enormous impact and an enormous cost. I have seen it. And it's happening in my state, all along the coast, all along the Eastern Seaboard. This is—there is just no question that this is the most significant problem that we face, and history will not judge us well if we don't confront it. And I believe the Inflation Reduction Act did confront it in very significant ways.

Can we fix it? Can we improve it? Absolutely. Can we work on how it is being implemented? Absolutely, but what worries me is when we are talking about trying to undermine these various programs—I just wrote down—we are fiddling while the planet burns. We are fiddling while the planet burns, and people are going to look back and say, yes, you addressed it, but you didn't really address it with a sufficient sense of urgency. And I think we have to talk about the impact of the climate crisis on us. And if you don't want to talk about saving the environment, talk about saving taxpayer dollars to deal with these Stafford Act responses that we are going to have to be undertaking in the next few weeks.

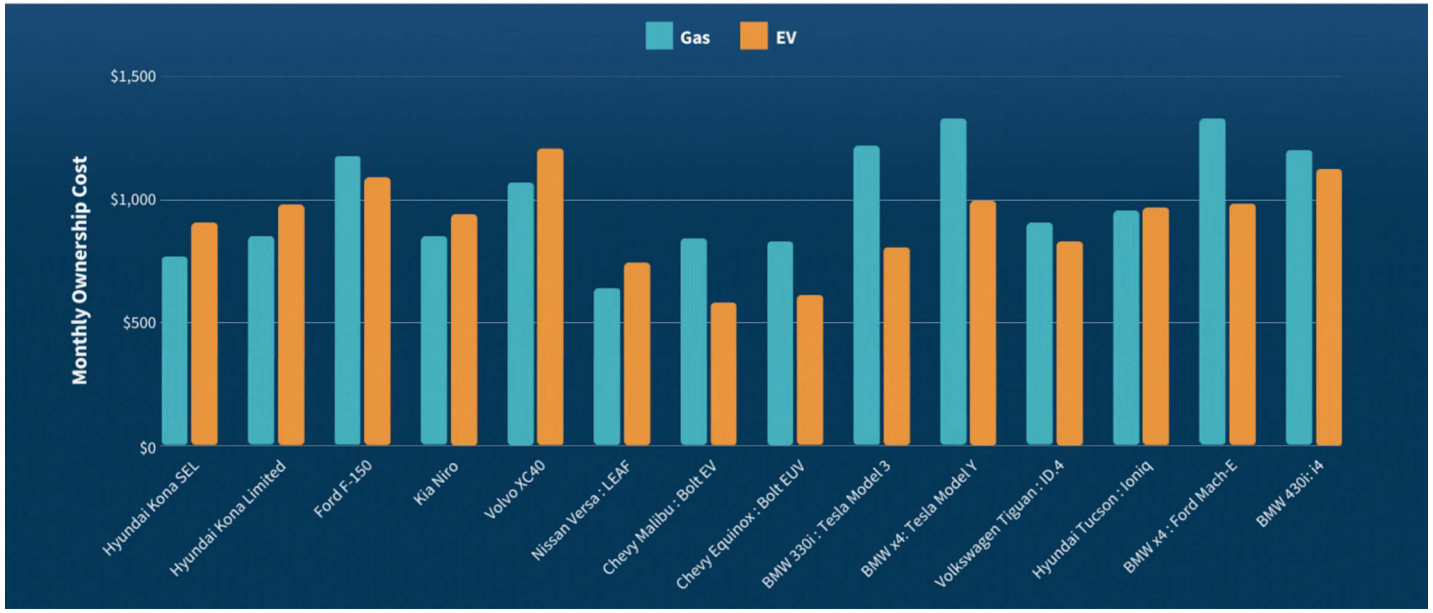
The other point I wanted to make is that batteries plus renewables is baseload power. Batteries plus renewables is baseload power. So this idea that you can only have baseload power from a plant that is running all the time—no, if you have renewables and if you have sufficient batteries, which the Department is doing huge amounts of research on, and in fact, it is being deployed. I think that is a very important point.

The other point is about—we have talked about electric vehicles—clearly, we are talking about new products to the market in the last few years. The price will come down and has come down substantially. And I think this chart is very informative because what it shows is, this is cost of ownership of EVs versus gas vehicles—whole bunch of different, you know, everything from a Ford F150, Hyundai, Kia, Volvo, Nissan, Chevy Malibu, and a Bolt.

[The chart referred to follows:]

More than half of EVs are cheaper to own and operate than their gas alternatives

ENERGY INNOVATION
POLICY & TECHNOLOGY LLC®



Senator KING. And what it shows is, and this includes the cost of buying the vehicle. So that is in this calculation, the financing cost. So what it shows is that half of these vehicles already are cheaper per month. For more than half of these vehicles, the EV is cheaper per month, including the capital costs. So I think that is really significant. And this is an early snapshot. I would venture to say that five years from now, it is going to be 90 percent of the EV vehicles are cheaper to operate. I have a plug-in hybrid. Yesterday, I put in my fifth tank of gas in three years. Just yesterday, my fifth tank of gas in three years. My total maintenance cost on that vehicle in three years has been $26 for one oil change.

The advantage to the consumer of these vehicles is enormous, and if what these incentives do is increase the uptake of the vehicles, which in turn increases the scale of their production, which in turn will lower the cost of these vehicles to the public, so——

The CHAIRMAN. Senator, can I ask one question?

Senator KING. Yes.

The CHAIRMAN. Does that include the $7,500 credit? In that base price? So without the credits, because the credits are going to go away eventually.

Senator KING. Yes. And I would say the credits are going to go away, and what is going happen is that the scale of production, mass production, is going to lower the price.

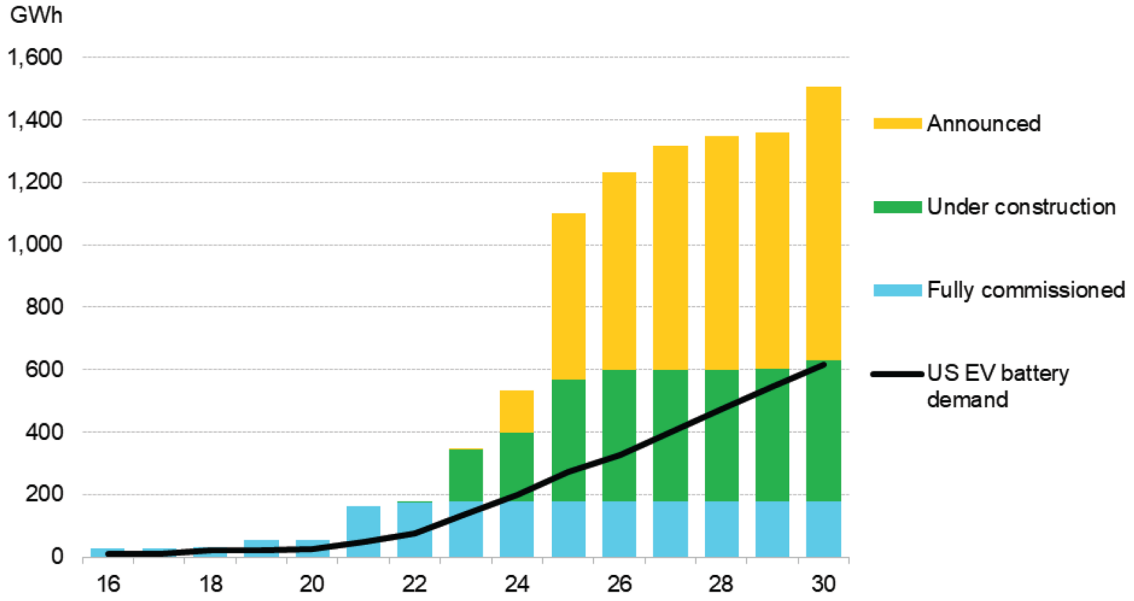
The CHAIRMAN. Got you.

Senator KING. And in fact, that is already starting to happen. My plug-in hybrid Toyota Prius Prime is about the same price as a Toyota Camry today. And the cost of operation is significantly lower.

The other piece about this that I think we need to emphasize is what is happening as a result of the Inflation Reduction Act. This is amazing. This is the expansion of battery manufacturing in the United States, largely as a result of the Inflation Reduction Act and the work of the Department, in terms of research, but what it shows is that this is EV demand. This is the projected growth of both announced, under construction, and fully commissioned that shows that this is the sort of dollars and sense impact of the Inflation Reduction Act that is really making a great difference in U.S. manufacturing, in jobs, and in bringing the supply chain home.

[The chart referred to follows:]

THE INFLATION REDUCTION ACT IS ACCELERATING U.S. BATTERY MANUFACTURING



Source: BloombergNEF, Zero-Emission Vehicles Factbook 2023

Senator KING. I have got eight seconds left, Mr. Turk, if you could find a question in there somewhere, you are welcome to it.

[Laughter.]

Mr. TURK. So I will maybe make a few points. On the cost perspective, and where we expect cost to go into the future, we have seen the battery cost that goes into an EV—and that's a huge part of the cost going into an EV—decrease 90 percent since 2008. And when we look at where that's going in the future, we continue to see dramatic cost reductions. Again, that's a huge part of the EV cost, 48 percent additional reductions on top of that 90 percent reduction already going out to 2030. So that's another data point in terms of the trajectory of where we are headed going forward.

The other nugget I would throw out there is, for those who are an EV owner, the average savings you have every year because of the lower cost of fueling and the less maintenance, is a thousand dollars per year, every year that you save because you have an EV.

Senator KING. Thank you, Chairman.

The CHAIRMAN. Thank you, Senator.

Finally, Senator Hawley.

Senator HAWLEY. Thank you, Mr. Chairman.

Secretary Turk, thank you for being here. Nice to see you again. Thanks to both of the witnesses for being here.

I want to just talk a little bit about who is really benefiting from this Administration's climate agenda and from these draconian electric vehicle mandates. So Mr. Turk, you have already alluded to this. I know you know the answer to these questions. Currently, one nation accounts for 60 percent of the world's electric vehicle production. That nation is?

Mr. TURK. China.

Senator HAWLEY. Yeah. One nation accounts for 76 percent of the world's lithium-ion battery production. That nation is?

Mr. TURK. China.

Senator HAWLEY. Yet, your Administration, this President's Administration, the mandates that you have put in place require that two-thirds of our new vehicle sales in just the next eight years—two-thirds of them—be electric vehicles. Your policies are driving us and our supply chains into the hands of our greatest geo-strategic enemy, enriching them, enriching their government, while forcing Americans to pay for electric vehicles that, on average, cost $7,000 more—on average—than a traditional vehicle, are more expensive to repair and insure, and require more frequent replacements of everything from tires to component parts. So Mr. Turk, why is it good for the American worker that we force our supply chains to a country that is our greatest rival and adversary? And why is it good for the American consumer?

Mr. TURK. So this is exactly why we are using all the tools that Congress gave us to diversify our supply chains, from the mining piece and especially the processing piece of just where China really has the stranglehold. So we are making significant progress on lithium, on graphite. You name it, the tools that you all have given us to diversify those supply chains and make sure that we are getting the benefits of that, our U.S. workers are getting the benefits of that. Citizens in St. Louis, I mentioned in my opening statement some exciting investments that are going on in St. Louis. We want

U.S. workers to benefit from this supply chain and this revolution, and China is absolutely competing. China is going whole hog on EVs and the full supply chain of it and they are going to compete and outcompete unless we are playing and pushing back and competing with them, which is what we are doing.

Senator HAWLEY. Okay, here is what I don't understand, then. Why is it, if that is the case, why is it that you are interpreting the Administration's climate law, the so-called Inflation Reduction Act—which I think, frankly, is bad enough on its own—but you are reinterpreting it now to allow the tax credits to flow to Chinese entities. So now, U.S. tax dollars are literally subsidizing Chinese battery makers. Why would we want to do that? Why would we want to not only give our adversary our supply chains and our jobs, but pay them to take them from us? Why does that make any sense?

Mr. TURK. So I would argue, and certainly want to turn to my Deputy Secretary at Treasury, that we are not doing that.

Senator HAWLEY. How are you not?

Mr. TURK. The fact that with the 30D tax credit only 13 models qualify at this point—now, we hope more diversification happens and more models qualify for that tax credit—is a good data point that we take this very seriously and we want to have these jobs in the U.S. But let me——

Senator HAWLEY. Wait, wait, wait, I just want to stay with you, Mr. Turk, just because my time is so limited. This is an important part, and the Chairman has brought this up, and I am glad that he has. This is really, really important. The Inflation Reduction Act, which I did not vote for, but nevertheless, the Inflation Reduction Act said clearly that China—if you are a foreign entity of concern, which includes China—you don't get the taxpayer subsidy. You don't get the 30D subsidy. You don't get the tax break. And yet, your rule allows Chinese companies to get the tax break. It loosens up the restrictions. So now we are subsidizing our rivals. I just don't understand.

The Chairman has asked you about this repeatedly. I don't understand why we would pay Chinese companies to outcompete us.

Mr. TURK. So I would strongly disagree with that. I spent a lot of time working with the team and we worked hand-in-hand with our Treasury colleagues on the FEOC—the Foreign Entity of Concern—the FEOC standards, and happy to go through the three prongs of that, in particular, in terms of what our proposal is on the table.

Senator HAWLEY. Well, that's the problem, right, is that the law, which, again, I didn't support, but the law says just no. It says no. And then you come back and say—it's what we lawyers like to call a multi-factor balancing test, which is usually what courts do when they want to get their way. So they will say well, it's complicated. We have got all of these different things and the effect of it is—it has been widely reported, this is not my opinion—everybody understands that what it does is, it allows Chinese companies, so long as they are not set up within mainland China, but owned and controlled by China, they can now get the tax credit. I just do not understand why we would use our tax money to pay the Chinese to make these vehicles.

Mr. TURK. So we are not. Only 13 models, again, have qualified for that 30D tax credit. A lot of companies right now—automakers are scrambling and they are working urgently to make sure that they don't have that——

Senator HAWLEY. If your rule had no effect, why would you change it? Why wouldn't you just leave the text of the IRA in place? The flat bar.

Mr. TURK. All of this is implementing the legislation that has been passed. And happy, again, to get into the details. Certainly if——

Senator HAWLEY. Last thing I have got because my time is expired. I know other Senators are waiting to ask questions, but this is important, just about the effect on American workers. Just looking at the news reporting on this. The Ford CEO says that EVs are going to require 40 percent less labor to produce than traditional cars. As production is shifting to the United States, this labor on, for instance, batteries, EV batteries, is increasingly being done in factories that are owned, co-owned at least, by foreign entities, and the wages for workers, who are usually not unionized, are substantially less than the wages for workers in traditional cars. Now, you mentioned my state. In Wentzville, Missouri, for example, we have almost 4,000 workers in a GM plant there. That's just one plant in just one area of my state. I want—believe me, I will take all the jobs you can give me, but I don't want those 3,000 workers to lose their jobs and to have another couple hundred created in some other state in a factory co-owned by a foreign company making half the wages. And that seems to be the trade-off that you are offering to American workers. That does not seem like a good trade-off to me.

With that, I yield, Mr. Chairman.

If you want to respond, Mr. Turk, go ahead, but I yield, Mr. Chairman.

Mr. TURK. I would just reiterate the number of jobs—136,000 jobs thanks to these tools that you have given us, thanks to this President, all across the country, including in St. Louis, but all across the country. That is an incredible record, and there are incentives, as the Chairman well knows, to make sure these are good-paying jobs that we have all across the country.

The CHAIRMAN. Senator Hickenlooper.

Senator HICKENLOOPER. Thank you, Mr. Chair. And I thank both of you for being here and answering these questions.

Let me start with Mr. Turk. As electric vehicle adoption rises, it clearly is going to save costs and reduce local pollution. It is going to help address climate change. Electric vehicles also create new opportunities to strengthen our electric grid, as you mentioned before, including vehicle-to-grid applications and the virtual power plants. How is the Department of Energy considering the role of electric vehicles in enhancing the reliability and resilience of the electric grid? And I know you have touched on this, but a little more specificity.

Mr. TURK. Well, thanks for your focus on this, Senator. I wish more people were focused on this. It is going to be a challenge, but there is a huge opportunity here if we do this right. First of all, transportation, as you know, is our largest source of greenhouse

gas emissions. So if we are not going to take transportation emissions head-on, we don't have a plan, and we do have a plan with this Administration, thanks to the tools you and other Senators have provided us on this. The fact that we are going to have so many new batteries out there as part of electric vehicles increasing—we are now at ten percent—quadrupled during the course of this President's Administration in terms of the number of vehicles, electric vehicles sold in our country. And that number will only increase. We are going to have all these batteries out there. That offers up an opportunity. It offers up an opportunity of when you time those batteries being recharged and time that when we have additional electricity coming in. So balance supply and demand.

What is particularly exciting, and we explored this in what we call the liftoff report on virtual power plants, is if you can have the two-way charging, that is, you can actually, in times of need, take electricity from those millions of batteries out there across the U.S. when we need it the most to balance the grids, that is an incredibly cost-efficient, effective way to do things, again, if we do this right. A lot of work we are doing at the Department is exactly on that.

Senator HICKENLOOPER. Right, and I appreciate the complexity, the challenge, but I also recognize and embrace the ultimate benefits. It does take me back to the '80s and the '90s, when the Federal Government incentivized directional drilling, eventually hydraulic fracturing, and the ways that we were able to enhance the recovery of natural gas in a cost-effective and highly efficient way. That was the Federal Government really investing to try and accelerate a transition, a transformation, which, I think, is what you guys are doing at this point.

Mr. Adeyemo, I wanted to talk a little bit about the IRA, the successful implementation and the provisions such as the 45X, the Advanced Manufacturing Production Tax Credit. Obviously, you have to prioritize access to these credits. The recent guidance—the definition of costs incurred would exclude direct and indirect material costs. That means the companies working to build a domestic supply chain of critical minerals will not be able to access this crucial tax credit. I worry. I mean, with the race toward energy security against global competitors, you know, how are we, and what is Treasury doing to help support a domestic supply chain of these critical minerals, and is there an opportunity to support companies trying to build a domestic supply chain of critical minerals—think of the Salton Sea—via the IRA tax credits?

Mr. ADEYEMO. Senator, thank you for the question.

I think the 45X tax credit is probably one of the most successful pieces of the IRA because what it is doing is driving a manufacturing revolution here in the United States. You are right that ultimately, we want to create incentives for not only the manufacturing, but also the mining. What we have done with 45X is, we set out a rule, but also asked a series of questions as to how we can do that. Ultimately, what we are trying to get at is making sure that people only get the 45X credit if they actually have value-add that is being created.

The thing we are trying to protect against is that the people who buy minerals potentially from abroad would then get access to the credit, and that money would flow to companies that are outside

the United States. So we have asked a series of questions within the proposed rule that will hopefully help stakeholders who are looking to mine and produce here in the United States, who are adding value, to be able to help us think about how we can design the rule in its final form to make sure that we are creating the right incentives. Ultimately, despite what Senator Hawley said, our goal here and what we have done is, we have designed these rules in a way that is incentivizing American companies. For example, 30D. 30D is helping Ford and GM be able to be in a position to not only compete with Chinese automakers, but to win, not only here in the United States, but around the world. No Chinese automaker is taking advantage of 30D. What we have seen to date is that the companies that are taking advantage of it are American companies who are using it to make the investments that they need to be able to build out the cars of the future, which are electric vehicles. And we hope that 45X will help reduce the cost of those batteries over time. But to your point, we want to make sure that they have access to the minerals that will go into those car batteries.

Senator HICKENLOOPER. Right, and I appreciate that, and I think you are certainly working in the right direction and establishing those supply chains and making sure that, well, we know that the most efficient and the most environmentally friendly ways of getting minerals are—that happens in the United States, and not as much in other parts of the world at this point. So there is a double benefit there.

Anyway, thank you so much.

Senator BARRASSO. It is magnificent, Mr. Chairman. We are sitting here and we have an administrator here, Honorable Mr. Adeyemo, what does it say up there? Your battery is running low.

That's the problem, Mr. Chairman.

The CHAIRMAN. Wally, we don't know if it is your battery or our battery. That's the problem.

Senator BARRASSO. Your battery is running low, and——

Senator HICKENLOOPER. I haven't yielded back to you guys yet. [Laughter.]

Senator BARRASSO. I wanted to alert him to the situation.

The CHAIRMAN. Can someone—do we have a technician here that can help us?

Senator BARRASSO. Mr. Turk, this is the issue. Batteries running low. Because you and Senator Lee talked about bidirectional charging. And I want you to clarify that, because do you mean utilities would be able to draw down a homeowner's electric car battery from their garage and drain it to help the grid someplace else? Because I am a doctor, I have gone to a lot of emergencies. What happens when an owner of an electric car has an emergency at three a.m., goes to their garage, and they find out their electric car is out of juice because this gobbledygook word of bidirectional charging has drawn them down?

Mr. TURK. So first of all, it has to be consumer-driven, and consumers should be the ones to take advantage of their asset, if they would like to take advantage of their asset right now. What is being contemplated right now, and what is actually being utilized right now is, when the battery gets charged, right, if you can time

when your battery gets charged to when you have lower electricity, or higher electricity generation, that helps balance the supply and demand and helps save you money and do things in an efficient perspective. If consumers want to, and if we have the technology worked out to have the bidirectional charging, just as you suggest, consumers can make money off of the fact that they own a battery. Now, they would need to take into account exactly your situation, right? You'd need to do it in a smart way so that you don't have batteries too low that you can take advantage of it if you need to in emergency circumstances. And this is what we need to work through using the smart folks at our national labs and others who are the true experts in this area.

The CHAIRMAN. Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman.

Interesting hearing. You know, I think we all recognize that there is great value in electric vehicles, but I hope what you are taking away, Mr. Turk, is this recognition that you have got an Administration that is approaching how we deal with this with one hand deliberately tied behind our back, and we are talking about the critical minerals that go into this. You know, I think the Administration is saying the right thing about minerals. We like minerals. We recognize that they are necessary, but they are not so keen on the issue when it comes to domestic mining.

And you know, I appreciate what you have shared, the exchange there with Senator Padilla about the great benefits, and you identified this source of lithium, but it's about access, because we can identify it, but if we don't permit it, if we don't allow for that access, if we don't help support it, and we are helping to support access elsewhere, and that is where I want to talk a little bit about what we are seeing going on right now. It seems like—the Department of Defense is really working with us on this, and I appreciate that—but it seems like the Administration is taking this approach that it's anywhere but China, because we all know, China, we have got to move away, got to move away for all the right reasons there. But then, when it comes to a country like Mozambique, that does not exactly have good labor standards and does not exactly have good environmental standards, then, it's all okay.

So I want to talk to you about that. You have got the background when it comes to critical minerals. You demonstrated that with your work at IEA. It's great. We get that. Secretary Adeyemo, I do not have a question for you this morning. I do have one that you are going to get as a QFR. But I want to just take one brief second to thank you for closing the loophole that was allowing Russia to evade sanctions on our seafoods that are such an important part of our market. So thank you. You are making a difference there. You always have to remember to thank people when they are doing good things.

So let's talk about my issue with what is going on with a fixation to get the resource from somewhere else, somewhere else other than here, because we don't really like the fact that when you mine, you have to dig a hole. And you look at what we are seeing going on with graphite. And you have mentioned a couple times in your testimony here today that we are going to see domestic graphite production increase 25-fold here. Projections show 16 percent of

graphite in EVs will be produced in the U.S. That's great. I am curious about what that timeline is on those assumptions because, again, what we are seeing right now doesn't match up. The example that I want to share with the Committee is, right now, DOE has awarded more than $320 million to a processing plant in Louisiana. My friend Bill appreciates that. But they are getting their graphite from Mozambique. DOE is now, I don't know that you have actually done this, but I understand that you are considering another $300 million loan guarantee for that project, which means more graphite from Mozambique. USDFC has announced $150 million in financing to help expand this Balama mine, and it's this mine in a super-unstable region in Mozambique. Unrest is significant. ISIS is active. Workers are paid so little that they went on an extended strike last year. There is all kinds of bad news coming out of there.

But you have got all that that DOE is supporting from a mine in Mozambique to get the graphite to help Louisiana out here, so we can process it here, so we can put that stamp that says "Made in America," but it is sourced somewhere else. In the meantime, what we have seen to help the largest graphite find in North America, coming out of Alaska—Graphite One—DOD is the only part of this Administration that has made an award. We got $37.5 million to help Graphite One move along. So here is my dilemma: we are helping to support a foreign mine, ultimately benefiting 10 to 20 times more, using U.S. taxpayer dollars, than we are providing support to our largest-known domestic source of graphite. So we know graphite is big. We know we have got a source. We have identified it. But we are not helping to facilitate that access. Instead, we are setting up support after support after support for Mozambique. I don't think that is right. I don't think that balance is right.

So how can you tell me that the Administration is really committed to domestic sourcing when we are not putting our resources there?

Mr. TURK. Well, thanks for the question, Senator. It is always good to see you.

Let me start just with the scale of the challenge, as you suggest. Right now, China absolutely dominates the graphite processing market, 100 percent. I mentioned the numbers earlier, and those are 2027 numbers, with the investments we have made so far, and we need to do a lot more. And I will get to that in a minute.

Senator MURKOWSKI. So by 2027, you really think that we are——

Mr. TURK. By 2027, with the investments we have made so far——

Senator MURKOWSKI. A 25 percent increase?

Mr. TURK [continuing]. It's 16 percent of what we need for graphite for passenger vehicles we will be able to take care of ourselves in the U.S.

Senator MURKOWSKI. Natural graphite?

Mr. TURK. Sixteen percent is not—that is the process piece of it with the inputs that come from it.

Senator MURKOWSKI. Right, right.

Mr. TURK. But 16 percent is not enough, right? We should do more than that. And I completely agree with you——

Senator MURKOWSKI. Well, and you would agree that it's not just about where we process it, it's where we get the stuff?

Mr. TURK. Completely agree. I was getting to that.

Senator MURKOWSKI. Okay.

Mr. TURK. The most secure place of any that we can get is here in the United States, right, assuming you do look at the environmental standards, you do it in the way that works for the communities, the state in which it is located.

I had a chance to get up to Alaska last year and met with the Graphite One leadership.

Senator MURKOWSKI. And we appreciate that, yes.

Mr. TURK. I had a chance to actually see the actual site in which they are proposing to work. I came away quite impressed at what they are doing. I have had conversations with my counterparts over at the Defense Department. They are putting in money. I think it's about $37.5 million right now of Defense Production Act——

Senator MURKOWSKI. Right.

Mr. TURK [continuing]. That was given by Congress to help get that going. We are particularly excited, and we are trying to connect the dots with our loan program. We have got a second round of funding coming through our battery manufacturing grant program——

Senator MURKOWSKI. Can I ask on that——

Mr. TURK. I would absolutely love——

Senator MURKOWSKI [continuing]. Because we are told, Mr. Turk, that what we are seeing, or what we are hearing, is that your mine project—the mine project itself is not eligible for DOE's loan program. They are only going to consider non-mine infrastructure, not the mine itself, and then they talk about, well, if a pilot project has been completed. So how does this help an operation like Graphite One?

Mr. TURK. Exactly, and happy to talk in depth with you and your staff on this and to work through it.

Senator MURKOWSKI. Okay.

Mr. TURK. We are trying to be as creative as possible with the tools and the authorities that we have.

There is one of our loan program efforts right now in conditional commitment—$700 million for Rhyolite Ridge in Nevada with a domestic supply of lithium carbonate. Love to work forward. I have had conversations with the CEO of Graphite One. I know our loan program is having conversations. Again, the loan program takes applications as they come in. So we are more than happy to have conversations and try to figure out which of the tools that we have currently will work to develop——

Senator MURKOWSKI. So if I can just ask for one clarification, and I know that we have another colleague here who is waiting, but is it—can you confirm to me that the mine itself, the project itself, is actually eligible for DOE loan guarantees or DOE loans?

Mr. TURK. So happy to have a detailed conversation. We are trying to be creative. A lot of times it is the mining and the processing piece. Rhyolite Ridge is an example of what we are able to do using our authorities. If there is any change in authorities we need, we

would be eager to work with you and the Chairman to try to make sure that we have the tools that we can to be maximally helpful.

Senator MURKOWSKI. Well, and I think——

Mr. TURK. We are going to need a lot of stuff at scale.

Senator MURKOWSKI [continuing]. That we need to do that because when Chairman Manchin and I were working on those Title 17 loan guarantees, I think we knew what we wrote in. I think we knew that we explicitly wrote in provisions in this infrastructure law to include mining. And we didn't think that there was any wiggle room there.

Mr. TURK. The most secure source of these critical minerals is here in the U.S., and we should absolutely, responsibly, and in an environmental way, with the community's support—and to speed up permitting. You mentioned permitting. The Chairman has been working on permitting. You both have been working on permitting for years and years. Eager to work on that too so we can play our part to try to accelerate.

Senator MURKOWSKI. Well, we have to do more with this, and what I am taking away from this exchange is that you can't assure me that, in fact, the mine projects are actually eligible for the DOE loan.

Mr. TURK. So——

Senator MURKOWSKI. So if we do have to get creative, even though we think that we were pretty clear in the law itself, allow me to work with you, work with the Chairman, to get creative to do so, because we cannot—you can't pass the red face test when you are putting 10 to 20 times more U.S. taxpayer dollars into mining projects in a place like Mozambique and telling places like Nevada, Alaska, West Virginia, that you might have the resource, but you are not eligible for that loan.

Mr. TURK. Happy to have further conversations. I have had great conversations with the CEO of Graphite One. I exchanged an email just earlier this week. Happy to follow up with real urgency here.

Senator MURKOWSKI. Good. I appreciate that.

Thank you, Mr. Chairman.

The CHAIRMAN. Senator Cortez Masto.

Senator CORTEZ MASTO. Really?

Let me just say, first of all, thank you both for being here. This is—I am a big fan of both pieces of legislation, the Bipartisan Infrastructure package, as well as the Inflation Reduction Act. It has been a benefit to Nevada and I know you both know that.

This chart shows, literally, not only to Nevada with the batteries and EVs and hybrid, and let me just say, hybrid vehicles are part of this.

[The chart referred to follows:]

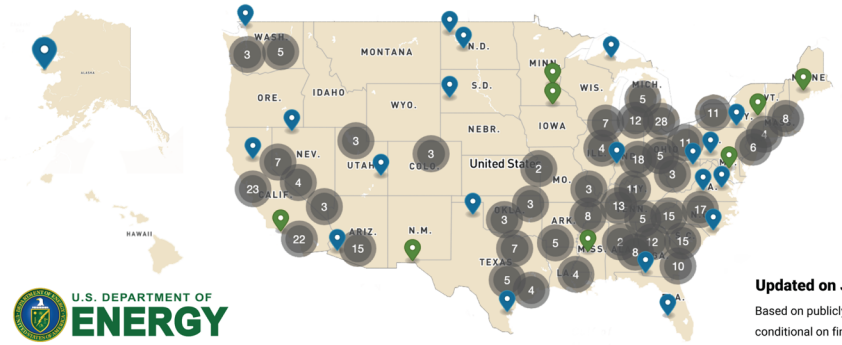
Building America's Clean Energy Future

BATTERIES

- Over $120 billion announced so far
- Announced battery cell factories could supply 10 million new electric vehicles each year
- Over 80,000 potential new jobs
- Over 200 new or expanded minerals, materials processing and manufacturing facilities

EVs, Component Parts, & Chargers

- Over $35 billion announced so far
- Announced production over 1,000,000 charging stations each year, with 60,000 fast chargers
- Over 50,000 potential new jobs
- Over 140 new or expanded minerals, materials processing and manufacturing facilities



U.S. DEPARTMENT OF ENERGY

Updated on January 10, 2024

Based on publicly available information. Many facilities are conditional on financing, funding, site control, and other factors.

Senator CORTEZ MASTO. It's all across the country. It's not just blue states. It's red states. It's everywhere where we are creating jobs. We are bringing opportunities. We are bringing that supply chain back to the United States. I am hoping, and let me just follow up, and I echo what my colleague from Alaska said, Senator Murkowski—we are starting at the extraction, the mining. That's the key part of all of this—the processing, the manufacturing, but this is the perfect example of—we're not putting the genie back in the bottle. This is not it. Not unless we, the way we implement the legislation and write the regs or the way that we get in our own way and either refuse to implement new legislation or undo what we have done already.

But here is why. This is so essential that we have to lead in this area. We have to develop our domestic manufacturing. We have to make sure that we are doing everything we can so that we don't repeat the mistakes of other critical technologies. We don't want to cede ground on the global stage. We don't want to end up reliant on hostile nations. This is important for national security. This is important for jobs. This is important to bring that supply chain back here. And by the way, the demand is out there. The demand is not going to change. So we might as well be flexible and create the new jobs that are going to come because of everything that we are doing here.

Now, with that said, I do have some concerns about how the Administration, at times—our intent is put out in this legislation. I appreciate that you are trying to figure out how to do the guidance. But sometimes the left foot is not walking with the right foot. And it is hindering what we are trying to do here. One of the areas that we talked about was 45X. And so, Deputy Secretary Adeyemo, let me talk to you about that because I understood what you said to Senator Hickenlooper. I understand what your intent is and what you said, which sounded really good, but I know what I am reading in the guidance. Let me just give you an example. The Nevada Battery Coalition noted that the guidance on 45X from Treasury states this: "Direct material costs as defined in the statute or indirect material costs as defined by statute and any costs related to the extraction or acquisition of raw materials would not be taken into account as production costs." And it goes on to say, "the cost of acquiring the raw material used to produce the electrode active material, the cost of materials used for conversion, purification, or recycling of the raw material, and other material costs related to the production of the electrode active material would not be taken into account."

That signifies to us that critical mineral processing is not being taken into account for this particular credit. And that is the concern we are all having. And so, I guess I am asking you, what you just said is not what this reads. And so as we look at implementation, and as attorneys look at this and everybody looks at implementing it, it is a little different. So how do we fix this or address this?

Mr. ADEYEMO. Senator, thank you for the question and thank you for the support. I know we have had conversations about the IRA that have been helpful in helping us think through the next steps we take. As you know, we have put out for 45X a notice of

proposed rulemaking. What that means is that ultimately, we have put out the guidance in order to get feedback from stakeholders and industry in terms of how we improve and make changes as we move toward finalization. As I said previously, our goal is to make sure that we are giving the credit for value-added activities within the process. One of the challenges we want to stay away from is making sure that both the credit doesn't go to, for example, minerals or things that are processed abroad and brought into the United States or that they are given to companies that aren't actually adding value. Ultimately, if stakeholders feel that we have gotten this wrong in terms of the way that we have defined value in terms of 45X, we look forward to that feedback. We actually encourage it. We ask a number of questions within the rule to help us better refine this in order to make sure that——

Senator CORTEZ MASTO. So can I, and I don't mean to interrupt you but I only have so much time here. Let me ask you this—based on what you are telling me, there is going to be more bureaucracy. When somebody goes to apply for this, they are going to have to ask—you are going to ask them several questions, including how this production, and the raw material, where it came from, and if you guys aren't satisfied that it came from a certain company or within the United States, they are not going to get it. Is that correct?

Mr. ADEYEMO. No, Senator, I apologize. What I was saying was that within the guidance that we put out, which was a proposed rule, we asked a number of questions that will help inform the final rule that we will put out. We are attempting to provide as much clarity for industry as possible, and our goal is to put out a final rule that addresses the types of questions that you have raised here. So I look forward to following up with you and talking to stakeholders in your state about this issue so it can inform the final rule that we put out that will provide more clarity to stakeholders.

Senator CORTEZ MASTO. Thank you. I appreciate that.

I know my time is up. I have to thank both of you. It's not an easy task. The pieces of legislation that we have passed are game changers for our future. It's not just two years, five years, it is ten years down the road. It's changing our energy infrastructure moving forward. It is bringing jobs back. Nevada is proof of it. It is creating, and it is a positive for our economy and revenues in our states. And yes, it addresses our national security. We do not want to be reliant on other countries. So this is key, and it requires us all to work together to make sure we are—at the end of the day, the Administration and how we implement it is having a positive impact. And I will go back to what Senator Angus King said, with the ultimate goal of addressing the climate crisis that we are dealing with.

So thank you. I appreciate you being here.

The CHAIRMAN. Thank you, Senator.

I have one quick question. I think Senator Hawley has a second question also. So I will go with mine and Wally, this is for you, okay?

When the Congressional Budget Office scored the Inflation Reduction Act in August 2022, they said the total cost of the con-

sumer EV credit would be about $7.5 billion. Yet, in Fiscal Year 2024, we would spend roughly $451 million on the credit. Recently, your agency announced that so far, 272,000 vehicles have been produced and could be eligible for the consumer EV credit in 2024 by itself. If they get the full credit of $7,500, if they would qualify, that would be two billion dollars just in one year. If they only got half of it, they would get one billion. You are going to run out of money in three and a half to four years, based on the CBO scoring.

So blowing past the score that was demonstrated, I don't know if it's intended that you should amend your proposals to match the letter of the law, basically staying within the confines of the money that we allotted for the entire bill, especially the way the CBO was scored. I don't know what your thoughts would be on that, how you have looked at that.

Mr. ADEYEMO. Senator, thank you for that question. While we have not talked about it, I do think that one of the most important things we did in the Inflation Reduction Act was raise additional revenue. And the biggest source of that additional revenue was, of course, the IRS, where you provided $80 billion of resources. And my view is that we are actually going to raise more revenues through the Inflation Reduction Act than CBO scored, largely because they undervalued the technology investments that we are making at the IRS that are leading to additional revenue. We have seen already revenue come in from millionaires and billionaires who have previously not paid taxes. The IRS has already made these investments and we think that will lead to additional deficit reduction over time.

With regard to the EV tax credit, ultimately the way that I think about this is, people only get the tax credit if they want to buy an electric vehicle. Ultimately, what this is going to mean is that there is going to be more demand for electric vehicles. That means that it is going to create more jobs producing those electric vehicles, which will lead to additional revenues for taxpayers as well. I can't tell you exactly how much money is going to be spent here in terms of the electric vehicle tax credit. That is going to be a factor of what happens with regard to demand from American consumers, and also to a degree what happens in terms of cost over time. And I think the 45X credit is going to bring down cost dramatically because of what it does to batteries.

But what I can tell you we are committed to doing is working with you and other Senators as we move from proposed rules to final rules to take into account your feedback and in making sure that we do what our shared goal is, which is to make sure that we build a supply chain in the United States that supports electric vehicles and energy security here and for our allies and partners going forward.

The CHAIRMAN. My only comment would be that our intention was to stay within the CBO scoring of how we paid for it so it would not add to our deficit. As you know, we are over $34 trillion and continue to grow in deficit. And in saying that, that I believe I would recommend to every one of my colleagues, Republicans, Democrats, that if you want to stop the deficit spending that we are doing, then every piece of legislation should be based around CBO scoring and the ability to have spending authority. So I will

give you an example. A bill that's basically on ten years of pay-fors and has ten-year spending authority, the spending authority should stop immediately when the CBO score is hit. If it's hit at three years and we thought it should be ten, then we should stop it there. That would stop all deficit spending. That's the biggest problem that Democrats and Republicans have had for the last decade or more. So if you want to know how it has grown the debt as quickly as we have—we underestimated, we overestimated, we never corrected. We allow you to spend for ten years, even though you run out of money in three. That means it's deficit spending. We borrow. That has to stop.

That is my recommendation, as my final year is wrapping up here in the Senate, that if you want to get us back on track financially, that would help us because something that is so popular, we have had this discussion before. When it's this popular, and people are demanding it, I will guarantee you, and we are all benefiting, Democrats and Republicans, we will come back and find additional ways to extend through appropriations and different bills. But you can't continue to do what we are doing playing a shell game. That's my input, and Secretary, and I appreciate, and you and I have had some good frank discussions. I would hope that you really look into this as seriously as possible and follow the guidelines of the bill. That is our intent.

With that, Senator Hawley.

Senator HAWLEY. Thank you, Mr. Chairman.

Mr. Turk, I just want to come back quickly to this question about workers, because I just think it's so important, you know, my friends on the other side of the aisle said that they believe that the overriding crisis is the climate. I just respectfully disagree with that. I think the overriding crisis we are facing is the wages and jobs of American workers. And it truly is a crisis for many, many American families, who, you know, both spouses have to work, even when they both work—I will just tell you a story about in Wentzville, Missouri, recently, the UAW strike, I was out on the picket line, and I was listening to one of the workers there who is my age. I am 44. He is my age. So he is not a young man anymore. And he was telling me that he has to, even working full time and working overtime, he can hardly afford—in fact, he said it takes him two paychecks to be able to pay for his rent in Wentzville, Missouri. You know, this isn't Manhattan. This isn't New York City. You know, this is Wentzville, Missouri. This is an affordable place. That is the crisis we are facing.

So in light of that, tell me why this is a good thing. This is from an article in Axios. I just want to quote: "Even as battery cell production shifts to the United States, that labor will likely be done by non-union workers at factories co-owned by foreign companies, and they," meaning the workers, "will make less money than workers at traditional power train factories." The article goes on: "For example, battery cell factories under construction in Kentucky and Tennessee are co-owned by Ford and a Korean company. They are starting their workers at, on average, $14 an hour less"—$14 an hour less—"than workers who are making engines and transmissions for traditional vehicles." How is that good for American workers?

Mr. TURK. So let me start with a thanks for focusing on this issue. One of the reasons I got into the government and took this job is, I grew up in Illinois, right next to Missouri, although in the northwest corner of the state. I was just back visiting with my folks over the holidays. Rock Falls is the name of the hometown. And it is a steel mill community. We have had those in West Virginia and other parts of the country as well. And when I was growing up the steel mill was basically shutting down. My entire childhood. So I got to see very directly what that means to a community. Right? The dysfunction that that causes in families, the fact that parents can't provide for their kids, et cetera, et cetera, et cetera. So this is near and dear to my heart.

I am honored to work for Secretary Granholm, who was Governor of Michigan, who has real-life experience in terms of the changes happening in the auto industry and how we can be smart, working together, and proactive to make sure we have got jobs for folks, high-quality, high-paying jobs. I also think we are smart enough in the U.S. I think we are exceptional and we can have those high-quality jobs. We can make sure we have got affordability for our consumers and we can make sure we tackle climate change as well. Transportation is the largest source of our emissions in our country, and we need to take that head-on.

Senator HAWLEY. I appreciate that answer, Mr. Turk, but you haven't really answered my question. I mean, let me read to you from another article. This is the Associated Press. And this says in quoting someone, this is just a statement of fact. And I quote, "If electric vehicles replace gas-powered ones, most UAW workers, for example, at engine and transmission plants will lose their jobs, and if lower-paying battery plants aren't union, workers won't have anywhere near the same wages and benefits."

So here, my nightmare scenario is that we repeat—because of this Administration's climate agenda—climate fixation, I would argue—we repeat and hypercharge the loss of industry we saw in the '70s and the '80s and the '90s, and we do it all over again. And so the remaining few things that we actually produce in this country, like automobiles, we won't produce anymore. And we may produce a few things, but even those will be co-owned with foreign companies. I mean, you mentioned steel. U.S. steel, an iconic American company, backbone of our steel production in this country, is apparently about to sell to a foreign company. I hope your Administration is going to block that sale. I urge the President to block it. He should absolutely block it, but for heaven's sake, let's not see what remains of our proud and strong auto industry be completely co-opted by foreign governments, foreign entities, and U.S. workers are left with very little. I mean, that's just a nightmare scenario. Wouldn't you agree?

Mr. TURK. So I am a firm believer in playing offense. And I think we are playing offense right now. I think we are being intentional. We are being aggressive. We are being purposeful. The fact that we have 136,000 new jobs across the country——

Senator HAWLEY. I don't think giving tax subsidies to Chinese companies is playing offense, Mr. Turk.

Mr. TURK [continuing]. Including 250 new jobs in Missouri because of these investments, because of these targeted, directed in-

vestments, planning for the future and making sure we are winning and competing against China. China is working incredibly aggressively to dominate——

Senator HAWLEY. And your Administration is helping them now by giving them these tax subsidies. And we are losing thousands of jobs because of your climate mandates that are forcing our production overseas and gutting our workforce. I just, I don't understand it.

Mr. TURK. Everything we are doing in this space, and I am happy to go chapter and verse on all the provisions that we are working on, is to re-shore, to make sure that these jobs, to make sure this economic opportunity is U.S. and our allies across the world. We have got a huge economic opportunity here. And the last thing we need to do is sit by idly, like what we have done in our country for too long. We are stepping up. We are playing offense. We are winning right now. My biggest fear is that someone puts a brake on it and we are not able to compete. Right now, we are competing and we are starting to win.

Senator HAWLEY. My biggest fear is that the Wall Street banks, they make a bunch of money on it because they have all invested in these foreign companies, and the foreign companies make a bunch of money on it, and we lose thousands of American jobs and American workers get their pay cut in half.

Thank you, Mr. Chairman. Thanks for indulging me.

The CHAIRMAN. Thank you, all.

Let me just first of all thank both of you. Secretary Adeyemo, thank you. I know that you are not up to par right now with the COVID, but we look forward to seeing you back in good health soon. And David, it is always good to have you here. It was very helpful. I think you know our concerns and our frustrations to a certain extent. But we all do—I mean, I say most of us—recognize that the Inflation Reduction Act has tremendous impact on the economy of the United States of America and it has taken us through a situation that could have been dire with inflation and recessions and unemployment that we prevented from happening.

If we can just get to more of the agreements and get the proposed rules versus permanent rules would be very helpful, I think it would bring a lot of clarity for investments that are being made and people want to make. So I am asking you all to work with us on that as closely as you possibly can.

Members are going to have until the close of business tomorrow to submit additional questions. And with that, the meeting is adjourned. Thank you both.

[Whereupon, at 12:03 p.m., the hearing was adjourned.]

APPENDIX MATERIAL SUBMITTED

U.S. Senate Committee on Energy and Natural Resources
January 11, 2024 Hearing: ***Federal Electric Vehicle Incentives Including the Federal Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains***
Questions for the Record Submitted to the Honorable David M. Turk

QUESTIONS FROM CHAIRMAN JOE MANCHIN III

Q1. I was disheartened to learn that the guidance released in December for 45X has excluded all material costs from eligibility, such as mining costs or the cost of chemicals and materials needed for mineral processing. This greatly reduces the usefulness of the credit to U.S. critical mineral producers and processors and will ultimately result in them looking to move their projects outside of the U.S. Do you agree it sends the signal that miners and processors shouldn't even try to invest in the U.S.? During the hearing Mr. Adeyemo mentioned that the Treasury is concerned about allowing raw materials cost to be considered in the calculation of production cost for critical minerals because it might allow foreign sourced materials to benefit from US taxpayer subsidies. Since production in the U.S is required in order to receive the credit, if raw materials costs were included, wouldn't that limit raw materials cost to only those raw materials that can be certified as produced in the United States?

A1. Expanding production of critical minerals in the United States is an Administration priority. As enacted by the Inflation Reduction Act, the Section 45X credit incentivizes producers of critical minerals to invest in the United States. The proposed regulations issued by Treasury in December 2023 would require taxpayers to perform the key activities in the production of critical minerals in the United States or a United States territory to claim the section 45X credit. Specifically, these activities would include the processing, conversion, refinement, or purification of source materials, such as brines, ores, or waste streams, to derive a distinct critical mineral.

Recognizing the importance of the domestic extraction industry and that a wide range of costs are incurred in the production of electrode active materials and critical minerals, the Treasury Department and the Internal Revenue Service (IRS) have requested comment on whether and how extraction costs and other similar value-added activities in the production of raw materials used in critical minerals and electrode active materials should be taken into account. We are committed to working with Treasury as they carefully consider all comments on the proposed regulations.

U.S. Senate Committee on Energy and Natural Resources
January 11, 2024 Hearing: ***Federal Electric Vehicle Incentives Including the Federal Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains***
Questions for the Record Submitted to the Honorable David M. Turk

Q2. Treasury recently released guidance on the 45X Advanced Manufacturing Production Credit that contained the correct definition of a manufactured battery component while Treasury's 30D guidance has misclassified the production of certain battery component as critical minerals processing rather than manufacturing. It makes no sense that there would be two different definitions in the same law. Why is there a discrepancy between the two definitions, and do you commit to fixing this in the final consumer EV credit rules?

A2. Thank you for your questions and concerns on the Treasury Department's guidance on 45X and 30D. We at the DOE are open to receiving and reviewing any and all of your comments – as well as others – as we assist the Treasury Department and IRS in the development of their proposed regulations.

Q3. It is critical that the Department expediently update GREET models as soon as possible, since Hydrogen Hub participants are waiting on guidance to ensure they can utilize innovative ways, such as fugitive methane emissions like coal mine methane and renewable natural gas, to produce hydrogen. Treasury recently released their proposed guidance and the 45V-H2 GREET model was introduced. Separately, Argonne released a GREET R&D model, which was segregated from policy implementation modeling. Additionally, it is our understanding that some feedstocks were grayed out and labeled as subject to further review, such as renewable natural gas and coal mine methane. What is the reasoning for this further review on these feedstocks and who is tasked with this review and releasing these feedstocks for the R&D model and subsequent inclusion in the 45V-H2 GREET model?

A3. As stated in the published supporting documentation for R&D GREET, [1] the model includes pathways that are preliminary such as those mentioned above. Such pathways may have gaps in available data and science and therefore additional external peer review is part of the rigorous process of evaluating and updating GREET. As stated in supporting documentation[2] for 45VH2-GREET, DOE expects to release future versions

[1] https://greet.anl.gov/publication-greet-2023-summary; pg. vi

[2] https://www.energy.gov/sites/default/files/2023-12/greet-manual_2023-12-20.pdf; pg. 25

of 45VH2-GREET on an approximately annual basis to include additional hydrogen production pathways.

Additionally, the Notice of Proposed Rulemaking (NPRM) [3] for the 45V tax credit asks for comment on lifecycle analysis considerations associated with renewable natural gas (RNG) pathways. As stated in the NPRM, responses to these comments may inform future versions of 45VH2-GREET. Pathways not in 45VH2-GREET such as coal mine methane may also be able to access the tax credit through the provisional emissions rate (PER) process, provided it satisfies the applicable rules for fugitive source of methane, as described in the NPRM.

[3] https://www.federalregister.gov/documents/2023/12/26/2023-28359/section-45v-credit-for-production-of-clean-hydrogen-section-48a15-election-to-treat-clean-hydrogen

U.S. Senate Committee on Energy and Natural Resources
January 11, 2024 Hearing: ***Federal Electric Vehicle Incentives Including the Federal Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains***
Questions for the Record Submitted to the Honorable David M. Turk

QUESTIONS FROM RANKING MEMBER JOHN BARRASSO

Q1. You testified that the most secure place to get minerals is here in the United States. Yet the Interior Department is actively preventing mineral development by withdrawing large swaths of federal land that could yield many of the minerals needed for electric cars.

a) Has your Department conveyed to the Interior Department the importance of mineral development on federal lands, where many American mineral resources exist?
b) If so, does the Interior Department plan to boost mineral production on federal lands?

A1. The DOE is committed to diversifying the domestic supply of critical minerals and materials by advancing domestic mining and processing, increasing recycling, recovering critical materials from unconventional sources such as brines, and supporting critical research into efficiencies and alternatives. And we routinely share our perspective with interagency partners. Specifically on domestic mining, DOI launched an interagency working group on mining reform (IWG) in response to E.O. 14017, which includes the DOE. In September, the IWG published its final report, "Recommendations to Improve Mining on Public Lands," containing recommendations to reform and improve the way mining is conducted on U.S. public lands. Within that report, the IWG recommends improving mineral exploration and development through consistent and coordinated permitting, consultation with Tribes, revitalizing domestic mines, safeguarding human health and worker safety, protecting such crucial resources as air and water, and following other best practices on federal lands.

U.S. Senate Committee on Energy and Natural Resources
January 11, 2024 Hearing: ***Federal Electric Vehicle Incentives Including the Federal Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains***
Questions for the Record Submitted to the Honorable David M. Turk

QUESTIONS FROM SENATOR RON WYDEN

Q1. Interconnections continue to pose a significant challenge for the deployment of medium and heavy-duty (MDHD) EV charging infrastructure. Charging developers face increasing estimated timelines for interconnections from utilities that are receiving simultaneous requests for power from real estate, clean energy, and charging infrastructure developers that clog their service queues. On average, charging interconnections take 12-18 months, but at the extreme, some MDHD charging developers are being told by utilities to expect a wait of up to 6 years as transmission lines and substations must be built out in a particular area to support expected load.

How is the DOE engaging utilities, developers, and other stakeholders to gather data and insights on interconnection timelines and to come up with innovative solutions on interconnection backlogs? What additional resources may benefit the DOE in addressing backlogs? In addressing delays, what role does the DOE see for collaboration with regulatory bodies or industry organizations to establish standards or guidelines for efficient utility interconnections for MDHD EV charging projects?

A1. DOE is working to understand the key barriers to interconnection (distributed energy resource generation, electric vehicle chargers with bidirectional energy flow, and energy storage) along with service load requests (chargers with one-directional electricity flow) and develop a roadmap to addressing those barriers for both transmission level and distribution level connectivity through the Interconnection Innovation e-Xchange (i2X) [4]. DOE has published a transmission interconnection roadmap to improve interconnection of clean energy resources[5] and plans to develop a distribution roadmap in the coming months, which is typically where challenges for EVs are experienced. In addition, DOE is engaging with local regulatory bodies to understand the challenges they are seeing and provide best practices from across the country. Proactive planning, along with innovative vehicle grid integration approaches are needed to address near term challenges while getting ahead of the need for future charging stations.

[4] https://www.energy.gov/sites/default/files/2023-07/doe-critical-material-assessment_07312023.pdf
[5] https://www.energy.gov/eere/articles/doe-releases-draft-roadmap-improve-interconnection-clean-energy-resources-nations

U.S. Senate Committee on Energy and Natural Resources
January 11, 2024 Hearing: ***Federal Electric Vehicle Incentives Including the Federal Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains***
Questions for the Record Submitted to the Honorable David M. Turk

DOE has funded a series of planning awards for medium-duty and heavy-duty electric truck infrastructure that will develop regional plans for charging infrastructure along key freight corridors in the U.S. Projects are working closely with electric utilities as project partners to proactively identify electricity interconnection needs associated with the planned infrastructure.

DOE is addressing the load service request and interconnection bottlenecks through cooperative agreements focused on engaging with utilities and EV fleets to implement innovative strategies to streamline the interconnection and service load request procedures for EV charging installations. These efforts are also working to increase visibility for near, mid, and long-term charging infrastructure planning to accelerate required grid upgrade investments and reduce deployment timelines.

Increasing transparency of accurate available hosting capacity, implementing automation when possible in the interconnection process, and mitigating delays due to the supply chain of critical grid upgrade equipment (switchgears, etc.) are imperative to accelerating EV charging deployment.

Additionally, the Joint Office of Energy and Transportation published a *National Zero-Emission Freight Corridor Strategy* for zero-emission MDHD freight to prioritize and sequence investments that accelerate the transition to zero-emission freight and goods movement, which was developed in coordination between DOE, DOT, and EPA, and aligns with the Federal Highway Administration's Freight Electric Vehicle Corridor designations.

U.S. Senate Committee on Energy and Natural Resources
January 11, 2024 Hearing: ***Federal Electric Vehicle Incentives Including the Federal Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains***
Questions for the Record Submitted to the Honorable David M. Turk

Q2. Local permitting also poses a challenge as municipalities with little to no experience with medium and heavy-duty charging infrastructure buildout struggle with outdated zoning and permitting policies that don't consider EV charging installations differently than fossil fuel stations.

How is the DOE helping states and localities to cut the red tape around these projects?

What opportunities may exist to partner with state and local governments that are doing this successfully to develop best practices guidance for EV charging hubs and depots?

A2. The Joint Office of Energy and Transportation (JO) has built strong relationships with state departments of transportation and Federal Highway Administration Division Offices, as well as formal partnership with the American Association of State Highway Transportation Officials (AASHTO) and the National Association of State Energy Offices (NASEO). The JO meets regularly with these partners to provide technical assistance on the transition to electrification. These connections and meetings are where the JO can share information with states, but equally important is that the states also share best practices and lessons learned with each other. Additionally, the JO recently formed the Electric Vehicle Working Group (EVWG), a federal advisory committee established under BIL which, among other things, is tasked with recommending solutions related to charging infrastructure permitting and regulatory issues. NASEO, AASHTO, and representatives from a Tribal and local government are members of this federal advisory committee. The Department of Energy is working with local governments through funding awards focused on providing technical assistance to authorities having jurisdiction (AHJs) to accelerate zoning and permitting for EV charging infrastructure. The program focuses on creating a network of information exchange between participating AHJs to share best practices to reduce zoning and permitting timelines. These efforts also include stakeholder engagement with utilities, major electric vehicle service providers (EVSPs) and Clean Cities coalitions to better understand the current challenges and develop a national scale framework for EV charging infrastructure deployment.

U.S. Senate Committee on Energy and Natural Resources
January 11, 2024 Hearing: ***Federal Electric Vehicle Incentives Including the Federal Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains***
Questions for the Record Submitted to the Honorable David M. Turk

Q3. As the Department of Energy continues its work in accelerating the development of charging infrastructure, more individuals, including those with disabilities, will come to rely on public charging stations. Further, one commonly cited concern of those considering purchasing an electric vehicle - particularly amongst women - is concern about user safety when using a public charging station. In expanding our clean transportation infrastructure, it is imperative that we not only focus on the technical and logistical issues that may arise, but also on the safety and well-being of the users of these facilities.

Can you please share what the DOE is doing to account for user safety and accessibility in the planning, design, and implementation of EV charging station infrastructure?

A3. The Joint Office of Energy and Transportation works closely with the Federal Highway Administration on the program guidance for government funded EV charging programs like the National Electric Vehicle Infrastructure and Charging and Fueling Infrastructure programs. The National Electric Vehicle Infrastructure minimum standards specifically address user safety and accessibility by mandating compliance with the Americans with Disabilities Act, National Environmental Policy Act, Title 23 of the U.S. Code, Buy American, and Davis-Bacon, and includes additional provisions on cyber and physical security.

U.S. Senate Committee on Energy and Natural Resources
January 11, 2024 Hearing: ***Federal Electric Vehicle Incentives Including the Federal Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains***
Questions for the Record Submitted to the Honorable David M. Turk

QUESTIONS FROM SENATOR MIKE LEE

Q1. Is the United States Geological Survey's critical mineral list and the methodology for creating such a list nimble enough to react to rapidly changing market conditions and geopolitical events?

A1. DOE's energy critical materials list complements the USGS critical minerals list. Both lists have a strong analytical foundation, and both consider market conditions and geopolitical risk. Pursuant to the authority under Section 7002(a) of the Energy Act of 2020, DOE released the 2023 Critical Materials Assessment (CMA) and Critical Materials List in July 2023. The CMA and corresponding list focus on the importance of materials to energy and decarbonization technologies, with an emphasis on forward-looking criticality that accounts for future demand, supply chain risks, changing market conditions, and the geopolitical landscape. The current USGS critical mineral list was released in 2022 and evaluates the criticality of minerals based on supply-side economic vulnerability and disruption potential. Both lists are updated every three years.

Q2. Does the United States Geological Survey need to employ more flexibility in the criteria used for determining the critical mineral list in order to meet the Biden Administration's electric vehicle mandates in the future, as well as the current demand placed on the grid by an increasing number of electric vehicles today?

A2. DOE issued its own Critical Materials Assessment (CMA) [6] in July 2023 to complement the USGS's critical mineral list by providing a forward-looking analysis to 2035 based on multiple clean energy deployment scenarios. In particular, the CMA incorporates analysis of material demand for multiple scenarios of growing EV deployment, including those with both high EV deployment trajectories and high material requirements for EV production. The CMA also includes analysis of materials required for grid upgrades. Furthermore, due to the dynamic nature of material criticality, DOE plans to update the

[6] https://www.energy.gov/sites/default/files/2023-07/doe-critical-material-assessment_07312023.pdf

assessment in approximately three years – following the cadence of the USGS. The update will reflect market conditions, technology advancement, technology adoption trends, production capacity, and the global policy landscape. DOE will continue to perform deep-dive supply chain studies to provide insights on vulnerabilities across specific supply chains and will use these to inform future assessments.

Q3. What is the cradle-to-grave carbon footprint of an electric vehicle across a ten-year lifespan that has been driven 120,000 miles? Please include the carbon footprint of the infrastructure used to power the electric vehicle, and a detailed explanation of how you arrived at the total.

A3. The cradle-to-grave emissions of a model year 2023 small SUV EV with a 300-mile range driven 120,000 miles are 30.12 metric tons CO2-e. This is 45% less than a similar internal combustion vehicle. Of the 30.12 metric tons CO2-e, the carbon footprint of the infrastructure used to power the electric vehicle is 0.12 metric tons CO2-e. These results are calculated in R&D GREET 2023 using the average U.S. electrical grid, including the burden of electricity infrastructure production. The calculation includes emissions from the manufacturing of the vehicle and components, electricity generation and associated infrastructure, and operations (e.g., zero tailpipe emissions for an electric vehicle). This emissions total is expected to fall in future as the electric grid becomes cleaner and manufacturing efficiency improves.

Note that the Vehicle Technology Office's Report to Congress on C2G Study of Electric Vehicles - EXEC-2022-001246 provided on May 4, 2022, utilized the 2021 version of the R&D GREET model, which has been updated in 2023, so the numbers vary slightly from those given above.

Q4. Does the Department of Energy maintain updated data on the impact of electric vehicles on the grid, the lifetime cost of an electric vehicle relative to an internal combustion engine vehicle, the costs passed to non-electric vehicle owners as a result of electric vehicle subsidies, and the overall carbon footprint of electric vehicles? If so, are these

databases easily accessible to the public?

A4. The Department regularly assesses the cost of technologies over time through publicly available tools such as Autonomie[7] and the Transportation Annual Technology Baseline[8]. In addition, regular updates on the environmental impacts of these technologies and pathways are assessed using the R&D GREET model[9]. The impact of EVs to the grid is very localized and dependent on local adoption and use of grid distribution system for charging. DOE has undertaken multiple studies on the impact of EVs to the grid, which show that EVs can be a resource to the grid and put downward pressure on electric rates.

The Department of Energy is also funding work to demonstrate smart charge management for EV charging across a range of use segments (residential, commercial, and public) and analyze the optimal structure to provide most value to the grid.

Q5. Is the current grid infrastructure as it exists today capable of supporting a mass increase in EV usage?

A5. Yes. The Nation's transmission and distribution infrastructure is capable of supporting a large increase of EVs by utilizing its normal processes of load service requests, interconnection requests, and distribution and transmission planning practices. Many potential EV impacts will be local, down to the neighborhood level, and a variety of mitigations are possible, including EV-specific rates to encourage off-peak charging; diversified charging options at home, work, and along the road; and smart charge management approaches. Less than two percent of our Nation's electricity currently goes to charge electric vehicles on an annual basis, and utilities, states, and communities are already exploring ways to improve our vehicle-grid integration processes through collaboration and shared investment. The Department maintains a substantial cross-

[7] https://www.anl.gov/taps/autonomie-vehicle-system-simulation-tool
[8] https://atb.nrel.gov/transportation/2022/index
[9] https://greet.anl.gov/

office internal collaboration called EVGrid Assist that ensures awareness and alignment of analysis, research, development, and demonstration activities to effectively partner with stakeholders on the adaptations necessary to ensure a reliable and affordable system.

In June 2023, the National Renewable Energy Laboratory released *The 2030 National Charging Network: Estimating U.S. Light-Duty Demand for Electric Vehicle Charging Infrastructure*, which provides a quantitative needs assessment for a national charging network capable of supporting the U.S. transition to EVs[a].
In the study, researchers estimated the number, type, and location of chargers needed to create a comprehensive network of EV charging infrastructure, one that can support an anticipated 30 – 42 million EVs on the road by 2030. The study concludes that near-term growth will rely more heavily on geographically distributed lower power charging, which carries a lower impact on the grid, with predictable high power charging growth that the grid can accommodate.

[a] https://www.nrel.gov/docs/fy23osti/85654.pdf

U.S. Senate Committee on Energy and Natural Resources
January 11, 2024 Hearing: ***Federal Electric Vehicle Incentives Including the Federal Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains***
Questions for the Record Submitted to the Honorable David M. Turk

QUESTIONS FROM SENATOR ANGUS S. KING

Q1. Mr. Turk noted in his testimony the battery recycling grants that were included in the IRA. I think this is very important because, unlike petroleum, battery minerals are almost infinitely recyclable. However, we need to make sure that those batteries are recycled domestically and stay in our supply chain. I've been told we don't currently track how much black mass or used EV batteries are exported.

How can we start measuring this, so we know what needs to be done to keep battery recycling domestic?

A1. Responsible and sustainable domestic sourcing of the critical materials used to make batteries will strengthen the American supply chain; accelerate battery production to meet increased demand; and secure our Nation's economic competitiveness, energy independence, and national security. Battery materials can in fact be recycled thousands of times without loss of performance. As a result, lithium-ion battery recycling represents a key strategic imperative for the creation of a resilient supply chain that is less dependent on foreign imports.

To handle materials generated during automotive battery qualification processes, the bulk of the U.S. black mass currently produced is being exported for processing. Exact figures are difficult to determine as there are no Harmonized Tariff Schedule (HTS) codes to quantify exports of black mass. The Federal Consortium for Advanced Batteries (FCAB), chaired by DOE, has identified the broader need to track battery materials exported from the country. Along this effort, FCAB has initiated the exploration of proper data sources and methodologies. Achieving widespread domestic recycling requires large infrastructure investments to drive down process and logistics costs. To reduce exports, domestic black mass processing facilities are under construction and are expected to come online in the next year.

For example, in the first round of grants for domestic battery manufacturing and supply chains from the Bipartisan Infrastructure Law (BIL), DOE's Manufacturing & Energy

Supply Chains Office (MESC) is already supporting two battery recycling projects that will establish significant capabilities to recycle lithium-ion batteries at commercial scale here in the US. Funding from BIL will be used to expand and upgrade Cirba Solutions' existing lithium-ion recycling facility in Lancaster, Ohio. Cirba Solutions will collect, disassemble, shred, and upgrade the critical minerals from tens-of-thousands of tons of lithium-ion batteries so the materials can be reused to produce new lithium-ion batteries for the domestic market. At full operation, the Lancaster facility will be one of the largest commercial-scale recycling facilities in North America, maintaining enough black mass in the United States to yield over 30,000 tons of battery materials. Also, BIL funds will support Ascend Elements to establish industrial scale U.S. production capacity of sustainable, low-cost precursor cathode materials from black mass. Ascend will recover over 35,000 tons per year of precursor cathode materials and metal salts. Together, these two MESC investments alone will support domestic production of domestically recycled battery materials to supply over 450,000 electric vehicles (EVs) annually, which is 40% of current annual EV sales in the US.

QUESTIONS FOR THE RECORD
United States Senate Committee on Energy & Natural Resources

"Hearing to Examine Federal Electric Vehicle Incentives Including the Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains"
January 11, 2024

Witnesses:

The Honorable Adewale Adeyemo, Deputy Secretary, Department of the Treasury
The Honorable David Turk, Deputy Secretary, Department of Energy

Questions for the Record Submitted by Chairman Joe Manchin III

Question 1

I was disheartened to learn that the guidance released in December for 45X has excluded all material costs from eligibility, such as mining costs or the cost of chemicals and materials needed for mineral processing. This greatly reduces the usefulness of the credit to U.S. critical mineral producers and processors and will ultimately result in them looking to move their projects outside of the U.S. Do you agree it sends the signal that miners and processors shouldn't even try to invest in the U.S.? During the hearing you mentioned that the Treasury is concerned about allowing raw materials cost to be considered in the calculation of production cost for critical minerals because it might allow foreign sourced materials to benefit from US taxpayer subsidies. Since production in the U.S is required in order to receive the credit, if raw materials costs were included, wouldn't that limit raw materials cost to only those raw materials that can be certified as produced in the United States?

> **Answer**: Expanding production of critical minerals in the United States is an Administration priority, and the section 45X Advanced Manufacturing Production Credit is a key part of our strategy to do that. On October 24, 2024, Treasury and the IRS issued final regulations on section 45X that provide clarity and certainty to taxpayers and include changes to further accelerate the buildout of domestic critical mineral supply chains.
>
> Notably, the final regulations allow taxpayers to include both direct and indirect materials costs and domestic extraction costs, in the calculation of production costs for applicable critical minerals and electrode active materials, provided certain conditions are met. Included direct and indirect materials costs must not relate to the purchase of an existing eligible component, and included domestic extraction costs must be incurred by the taxpayer that claims the credit for the applicable critical mineral or electrode active material. These requirements maximize the incentive for domestic critical mineral production, while safeguarding against potential abuse and over-crediting.
>
> We carefully considered all feedback, including yours, before issuing final regulations.

Question 2

Treasury recently released guidance on the 45X Advanced Manufacturing Production Credit that contained the correct definition of a manufactured battery component while Treasury's 30D guidance has misclassified the production of certain battery component as critical minerals processing rather than manufacturing. It makes no sense that there would be two different definitions in the same law. Why is there a discrepancy between the two definitions, and do you commit to fixing this in the final consumer EV credit rules?

> **Answer:** The final regulations under section 30D define the term "battery component" consistent with the statutory language, including the requirement that battery components

be "manufactured or assembled." Section 30D is explicit when it requires consistency between terms that are used in both sections 30D and 45X. The term "battery component" in section 30D is not statutorily defined by cross reference to section 45X. Moreover, section 30D looks to a material's production steps to determine its status as an applicable critical mineral or a battery component. The preamble to the 30D final regulations summarizes the comments received regarding the definition of battery component and the Treasury Department and IRS's consideration of these comments.

Question 3

I am concerned by recent reports that suggest Chinese battery companies are actively pursuing business opportunities and arrangements, including joint ventures and investments, in South Korea and Morocco to take advantage of the IRA. I am also concerned that the Administration is exploring limited trade agreements with countries like Indonesia where Chinese investment in the nickel sector reached $3.6 billion in the first half of 2022. How are you ensuring that China does not find and utilize loopholes to benefit from the IRA?

Answer: The section 30D regulations are strengthening domestic supply chains for batteries and safeguarding our national security. Under the final rules, as under the statute, starting in 2024, if a vehicle's battery has battery components manufactured or assembled by a foreign entity of concern (FEOC), the vehicle is not eligible for the section 30D Clean Vehicle Credit. Starting in 2025, batteries cannot contain critical minerals that are extracted, processed, or recycled by a FEOC. Treasury's final rules detail how automakers must comply with those restrictions, including the due diligence they must undertake and the certifications they must provide under penalty of perjury.

The definition of "foreign entity of concern" for the IRA's Clean Vehicle Credit is based on the Bipartisan Infrastructure Law definition, and specifically, the battery grant program that the Department of Energy administers. Under DOE's interpretive guidance, the government of China and companies controlled by the government of China are foreign entities of concern, including ownership interests by party officials.

After careful consideration of the comments received on the proposed regulations, Treasury has finalized regulations that are fully consistent with the statute and that will advance the goals of stronger supply chains and energy security.

Question 4

It is critical that the Department expediently update GREET models as soon as possible, since Hydrogen Hub participants are waiting on guidance to ensure they can utilize innovative ways, such as fugitive methane emissions like coal mine methane and renewable natural gas, to produce hydrogen. Treasury recently released their proposed guidance and the 45V-H2 GREET model was introduced. Separately, Argonne released a GREET R&D model, which was segregated from policy implementation modeling. Additionally, it is our understanding that some

feedstocks where grayed out and labeled as subject to further review, such as renewable natural gas and coal mine methane. What is the reasoning for this further review on these feedstocks and who is tasked with this review and releasing these feedstocks for the R&D model and subsequent inclusion in the 45V-H2 GREET model?

> **Answer:** As this question was directed to Deputy Secretary Turk, we defer to the Department of Energy on this subject matter.

Questions for the Record Submitted by Senator James Risch

Question 1

Treasury recently promulgated draft guidance for how it will define eligibility for IRA incentives for Foreign Entities of Concern (FEOC). An exception was made for foreign subsidiaries of privately-owned Chinese companies in friendly countries, like Australia and Indonesia.

a. *As we work to reduce our reliance on geopolitical adversaries like China and Russia by incentivizing domestic critical mineral production, processing, refining, and manufacturing of EV's, does this carve out for Chinese companies help or hinder this goal? Yes or No?*

Answer: Treasury defers questions on the definition of a Foreign Entity of Concern to the Department of Energy, whose guidance under the Bipartisan Infrastructure Law provides the relevant definition.

b. *How does this allowance for Chinese companies support greater domestic supply chain security?*

Answer: We defer to the subject matter expertise of other agencies on this matter.

Questions for the Record Submitted by Senator Angus S. King

Question 1

Mr. Turk noted in his testimony the battery recycling grants that were included in the IRA. I think this is very important because, unlike petroleum, battery minerals are almost infinitely recyclable. However, we need to make sure that those batteries are recycled domestically and stay in our supply chain. I've been told we don't currently track how much black mass or used EV batteries are exported.

How can we start measuring this, so we know what needs to be done to keep battery recycling domestic?

> **Answer:** The Treasury Department defers to Deputy Secretary Turk and the Department of Energy on this subject matter.

Questions for the Record Submitted by Senator Mike Lee

Question 1

Is there any equivalent to the federal gas tax that EV users must pay when charging a vehicle?

Answer: No.

Question 2

According to Kelley Blue Book, the average cost of a new EV in 2023 was $53,469, which is unaffordable for many Americans even with a tax credit. By subsidizing EV purchases, the federal government is effectively exempting wealthy Americans from gasoline taxes for roads. Why is the Treasury Department forcing middle and low-income taxpayers to carry the socialized cost burden created by subsidies for luxury vehicles purchased by the wealthy?

Answer: The role of the Treasury Department is to implement tax legislation as passed by Congress. We are engaged in a process to write rules to implement the Inflation Reduction Act as passed by Congress and welcome your input. That being said, it is worth noting that eligibility for the section 30D Clean Vehicle credit and the section 25E Previously-Owned Clean Vehicle credit is limited by statute to filers whose modified adjusted gross incomes (AGIs) are at or below certain thresholds. For example, filers must have modified AGIs at or below the following thresholds to qualify for the Clean Vehicle credit: $300,000 for married couples filing jointly or a surviving spouse, $225,000 for heads of households, and $150,000 for all other filers. Each of these thresholds is 50% lower for the Previously-Owned Clean Vehicle credit. In addition, the statutes limit eligibility to vehicles below certain MSRP and sales price limits. The 30D Clean Vehicle credit is limited to vans, trucks, and SUVs with MSRPs below $80,000, and all other vehicles with MSRPs below $55,000. Vehicles eligible for the 25E Previously-Owned Clean Vehicle credit must have a sales price of $25,000 or less.

Question 3

Of the vehicle owners in areas with a minimum poverty rate of 20 percent or a rural census tract, what percentage currently own electric vehicles?

Answer: We do not collect this data and otherwise defer to other experts on this question.

Question 4

103

Why is the Treasury Department incentivizing companies to place alternative fuel vehicle refueling properties in areas with the grid infrastructure least likely to be capable of supporting additional EV usage?

Answer: The role of the Treasury Department is to implement tax legislation as passed by Congress. We are engaged in a process to write rules to implement the Inflation Reduction Act as passed by Congress and welcome your input.

Questions for the Record Submitted by Senator Steve Daines

Question 1

Secretary Adeyemo, the 45X credit was created in part to help increase domestic critical minerals production. However, Treasury guidance currently disallows mining and extraction costs. Please explain why Treasury believes that a tax credit meant to increase domestic critical mineral production cannot be used for mining activities.

> **Answer**: Expanding production of critical minerals in the United States is an Administration priority, and the section 45X Advanced Manufacturing Production Credit is a key part of our strategy to do that. On October 24, 2024, Treasury and the IRS issued final regulations on section 45X that provide clarity and certainty to taxpayers and include changes to further accelerate the buildout of domestic critical mineral supply chains.
>
> Notably, the final regulations allow taxpayers to include in both direct and indirect materials costs and domestic extraction costs, in the calculation of production costs for applicable critical minerals and electrode active materials, provided certain conditions are met. Included direct and indirect materials costs must not relate to the purchase of an existing eligible component, and included domestic extraction costs must be incurred by the taxpayer that claims the credit for the applicable critical mineral or electrode active material. These requirements maximize the incentive for domestic critical mineral production, while safeguarding against potential abuse and over-crediting.
>
> We carefully considered all feedback, including yours, before issuing final regulations.

Question 2

Secretary Adeyemo, the 45X credit is 10% of the production cost of the critical minerals it produces. Please explain why only the final processes of critical mineral production may claim the 45X credit, rather than the extraction itself.

> **Answer:** See answer to Question 1 (above).

Question 3

Secretary Adeyemo, in response to questions from Senator Hickenlooper relating to the 45X tax credit you stated that the Treasury Department is awaiting stakeholder input before moving forward on guidance for critical mineral mining and extraction. Further you stated that you are trying to protect against companies using the 45X credit to support mining in other countries.

However, I am concerned this is being used as an excuse as Treasury has had over a year to collect stakeholder input and further, clarifying whether a company seeking the 45X credit is mining domestically or internationally does not seem like a hard issue to verify. Will you commit to quickly finalizing guidance on the 45X credit that promotes domestic mineral mining and extraction so that the United States can build jobs and reduce our dependence on China and other adversaries for these minerals?

Answer: See response to Question 1 (above)

Question 4

Secretary Adeyemo, Montana is blessed with a diverse topographical landscape. Long distances between towns on two lane roads is the norm in Montana not the exception. Further, extreme temperatures and shifts in weather are common in Montana. For example, in Scobey the high on Wednesday, January 10th, was +22 degrees Fahrenheit and the low for Friday the 12th is -33 degrees Fahrenheit. These unique features of Montana make adoption of EVs difficult, impractical and expensive. Yet the administration is pushing through one-size fits all mandates at the same time has making it more difficult to own and fuel up traditional vehicles. Why does Treasury and this administration fell the need to ignore Montanans and rural America and prioritize one size-fits all, unattainable mandates that ignore the reality and needs of consumers?

Answer: The role of the Treasury Department is to implement tax legislation as passed by Congress. We are engaged in a process to write rules to implement the Inflation Reduction Act as passed by Congress and welcome your input.

Questions for the Record Submitted by Senator John Hoeven

Question 1

The Department of the Treasury is proposing to narrow the definition of "production costs" for the purposes of calculating the 45X Advanced Manufacturing Production Tax Credit for battery components. Why is Treasury excluding costs related to the extraction or acquisition of raw materials under the proposal, and what is the specific policy or legal justification?

> **Answer:** Expanding production of critical minerals in the United States is an Administration priority, and the section 45X Advanced Manufacturing Production Credit is a key part of our strategy to do that. On October 24, 2024, Treasury and the IRS issued final regulations on section 45X that provide clarity and certainty to taxpayers and include changes to further accelerate the buildout of domestic critical mineral supply chains.
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> Notably, the final regulations allow taxpayers to include in both direct and indirect materials costs and domestic extraction costs, in the calculation of production costs for applicable critical minerals and electrode active materials, provided certain conditions are met. Included direct and indirect materials costs must not relate to the purchase of an existing eligible component, and included domestic extraction costs must be incurred by the taxpayer that claims the credit for the applicable critical mineral or electrode active material. These requirements maximize the incentive for domestic critical mineral production, while safeguarding against potential abuse and over-crediting.
>
> We carefully considered all feedback, including yours, before issuing final regulations.

Question 2

Do you agree that we should increase more domestic sources of critical minerals to lessen our resource reliance on imports – often from countries with lax environmental or labor standards?

> **Answer:** See response to Question 1 (above).

Question 3

Will Treasury consider including raw materials under the 45X credit, to encourage more domestic sourcing of critical minerals – and thus strengthen our minerals supply chain away from adversaries like China and Russia?

> **Answer:** See response to Question 1 (above).

Letter for the Record

January 11, 2024

The Honorable Joe Manchin
Chairman
Committee on Energy and Natural Resources
United States Senate
Washington, D.C. 20510

The Honorable John Barrasso
Ranking Member
Committee on Energy and Natural Resources
United States Senate
Washington, D.C. 20510

Full Energy and Natural Resource Committee Hearing to "Examining federal electric vehicle incentives including the Federal government's role in fostering reliable and resilient electric vehicle supply chains."

Chairman Manchin, Ranking Member Barrasso, and Members of the Committee,

Thank you for the opportunity to submit a letter for the record. My name is Ashley Nunes. I am the Director for Transportation Policy at the Breakthrough Institute and a Senior Research Associate at Harvard Law School. The Institute is a global research center that identifies and promotes technological solutions to environmental and human development challenges. We believe that human prosperity is compatible with an ecologically vibrant planet, and we are committed to a world that is good for both people and nature.

My work at Breakthrough focuses on analyzing the effectiveness of emissions reduction pathways in the transportation sector. One of these pathways is the accelerated deployment of electric vehicles (EVs). Implementation of the Inflation Reduction Act has included numerous initiatives to accelerate EV adoption. These programs have been paired with ambitious regulatory efforts, notably the Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles[1]. Combined, public subsidies for EV manufacturing and purchase and federal regulatory restrictions on emissions from gasoline and diesel-powered vehicles could result in over 67 percent of new vehicles sold being electric by 2032[2].

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[1] "Proposed Rule: Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles | US EPA." *Environmental Protection Agency*, https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-multi-pollutant-emissions-standards-model. Accessed 24 July 2023.

[2] "Biden-Harris Administration Proposes Strongest-Ever Pollution Standards for Cars and Trucks to Accelerate Transition to a Clean-Transportation Future." EPA, Environmental Protection Agency, 12 Apr. 2023, www.epa.gov/newsreleases/biden-harris-administration-proposes-strongest-ever-pollution-standards-cars-and.

While we support efforts that reduce emissions, and recognize EVs potential to help achieve this goal, we believe it is concurrently important to recognize challenges posed by these efforts. Where EVs are concerned, three challenges warrant scrutiny by this committee.

Challenge 1, Cost: EV adoption faces challenging cost barriers. Average up front prices for purchasing an EV are thousands of dollars more than Internal Combustion Engine (ICE) powered vehicles. This price difference is often dismissed based on technological learning, particularly where battery technology is concerned. As production volume increases, prices can – and will - we are told decrease[3]. Yet, EV sales have soared, and battery prices have dropped, from $1059 per kWh in 2011 to $245 per kWh in 2017 to $153 per kWh in 2022, the average inflation-adjusted price of an EV has steadily increased over time, from $43,871 in 2011, to $62,760 in 2017, to $74,460 in 2022. Put simply, lower costs in one part of the manufacturing chain do not necessarily translate into lower costs for consumers.

Challenge 2, Minerals: Because EVs are more mineral intensive to build (compared to ICE-powered vehicles), mass manufacture – and consequently, widespread adoption - of EVs is dependent on access to sufficient mineral supply. We estimate that complying with the Administration's electrification targets will require, at minimum, a 62 percent increase in cobalt and a 590 percent increase in graphite[4]. Neither of these minerals are found in large quantities in the United States[5]. While 'friendshoring' is often proposed as a means of addressing domestic mineral insecurity, it is – we argue – unrealistic to expect our allies will share the totality of these mineral supply with us. Our allies have electrification targets of their own. Consequently, it may be necessary – where specific minerals are concerned – to expedite domestic mine permitting and development, and/or relax the domestic content requirements in the Inflation Reduction Act.

Challenge 3, Mileage: An EV only reduces emissions if it can offset both gas-powered driving emissions and the emissions needed to manufacture the EV. The latter is particularly important because manufacturing an EV imposes a far larger upfront carbon cost than does building an ICE vehicle[6]. My work with Lucas Woodley and Philip Rossetti finds that EVs must – in some cases - cover over 68,000 miles to realize an emissions advantage over similarly sized and equipped ICE vehicles[7]. However, because EVs are often purchased as secondary or tertiary vehicles, they are typically driven less by their

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[3] Lutsey, Nic, and Nicholas, Michael. "Update on electric vehicle costs in the United States through 2030." 2019. *The International Council on Clean Transportation*, https://theicct.org/sites/default/files/publications/EV_cost_2020_2030_20190401.pdf. Accessed 17 June 2023.

[4] Woodley, Lucas, et al. "Enumerating the Climate Impact of Disequilibrium in Critical Mineral Supply." arXiv.org, 27 Sept. 2023, arxiv.org/abs/2309.15368.

[5] U.S. Geological Survey. "Mineral Commodity Summaries 2023." *U.S. Geological Survey*, 31 Jan. 2023, https://doi.org/10.3133/mcs2023

[6] Stock, Kyle. "The Wrong Americans Are Buying Electric Cars." Bloomberg, 15 Nov. 2022, https://www.bloomberg.com/news/articles/2022-11-15/the-wrong-americans-are-buying-electric-cars?leadSource=uverify+wall.

[7] Nunes, Ashley, et al. "Re-thinking procurement incentives for electric vehicles to achieve net-zero emissions." *Nature Sustainability*, vol. 5, no. 6, 2022, pp. 527–532, https://doi.org/10.1038/s41893-022-00862-3.

owners[8,9,10]. We estimate that such vehicles remain in service for over 10 years to deliver an emissions benefit. There is little evidence that suggests this is currently happening.

These challenges do not – we argue - diminish the importance of vehicle electrification as a pathway towards emissions reductions. EVs can – when appropriately deployed, - deliver meaningful and timely reductions in emissions. However, the adoption of EV deployment targets that cannot – for reasons of cost, consumer needs and preferences, or mineral scarcity, - be met, warrants scrutiny by this Committee. Finally, we emphasize that to the extent that maximizing emissions reductions per dollar spent is a priority, policies that favor vehicle electrification for high mileage sectors (e.g., taxi and trucking) is timely[11].

Sincerely

Ashley Nunes, PhD
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Breakthrough Institute
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[8] Davis, Lucas W. "Electric Vehicles in Multi-Vehicle Households." Applied Economics Letters, 1 June 2022, pp. 1–4., https://doi.org/10.1080/13504851.2022.2083563.
[9] Xing, Jianwei, et al. "What Does an Electric Vehicle Replace?" Journal of Environmental Economics and Management, vol. 107, May 2021, p. 102432., https://doi.org/10.1016/j.jeem.2021.102432
[10] Zhao, Lujin, et al. "Quantifying electric vehicle mileage in the United States." *Joule*, vol. 7, no. 11, 2023, pp. 2537-2551. *Cell*, https://www.cell.com/joule/pdf/S2542-4351(23)00404-X.pdf. Accessed 10 January 2024.
[11] Woodley, Lucas, et al. "Targeted electric vehicle procurement incentives facilitate efficient abatement cost outcomes." *Sustainable Cities and Society*, vol. 96, Sept. 2023, p. 104627, https://doi.org/10.1016/j.scs.2023.104627.

Written Testimony of Robert Bryce[1]
To the Committee on Energy and Natural Resources
United States Senate,
For a hearing "to examine federal electric vehicle incentives including the federal government's role in fostering reliable and resilient electric vehicle supply chains."
January 11, 2024

Mr. Chairman and members of the committee, I am grateful for the opportunity to provide written remarks regarding electric vehicles and the future of EVs in the United States.

Before going further, please allow me to provide a bit of background. I am an independent journalist. I have published six books on the energy and power sectors and have been reporting on the energy industry for over 30 years. I have written extensively about EVs and have consistently been skeptical about them. In my fourth book, *Power Hungry: The Myths Of "Green" Energy and the Real Fuels Of The Future*, published in 2010, I devoted an entire chapter to EVs. I wrote:

> There's no question that electric vehicles have many positive attributes: low refueling costs, no air pollutants at point of use, and quiet operation. Despite their promise, the all-electric car continues to be hampered by the same drawbacks that have haunted it for a century: limited range, slow recharge rates, lack of recharging stations, and high costs, particularly when compared to conventional cars. In short, the problems today are the same as they were back in Thomas Edison's day.

The same issues that I underscored 14 years ago remain true today. Those drawbacks are particularly relevant given the EPA's proposed mandate that would require two-thirds of new vehicles sold in the U.S. to be all-electric by 2032.

In these remarks, I will make three points. First, I will show that EVs have never lived up to their hype. Second, I will discuss today's EV market, why automobile dealers are pushing back against the Biden Administration's mandates, and show that EV sales are concentrated in a very narrow segment of the U.S. population. Third, and most important for this hearing, I will discuss the EV sector's near-total reliance on Chinese supply chains for metals, minerals, and high-coercivity magnets.

EVs have never lived up to the media hype.
The history of the EV is a century of failure tailgating failure. In 1901, in an article headlined "Edison's New Storage Battery," the *Los Angeles Times* declared, "The electric automobile will quickly and easily take precedence over all other" types of motor vehicles. It said, "If the claims which Mr. Edison makes for his new battery be not overstated, there is not much doubt that it will make a fortune for somebody."[2] The media hype continued for the next 100 years:

• In 1911, the *New York Times* reported that the electric car "has long been recognized as the ideal solution" because it "is cleaner and quieter" and "much more economical."[3]

• In 1915, the *Washington Post* wrote that "prices on electric cars will continue to drop until they are within reach of the average family."[4]

• In 1959, the *New York Times* claimed the "Old electric may be the car of tomorrow." The story said EVs were making a comeback because "gasoline is expensive today, principally because it is so heavily taxed, while electricity is far cheaper" than it was in the 1920s.[5]

• In 1967, the *Los Angeles Times* reported that American Motors Corporation was on the verge of producing an electric car, the Amitron, which would be powered by lithium batteries capable of holding 330 watt-hours of energy per kilogram. (That's greater than the energy density of modern lithium-ion batteries.) Backers of the Amitron declared, "we don't see a major obstacle in technology. It's just a matter of time."[6]

• In 1979, the *Washington Post* claimed General Motors had achieved "a breakthrough in batteries" that "makes electric cars commercially practical." The new zinc-nickel oxide batteries will provide the "100-mile range that General Motors executives believe is necessary to successfully sell electric vehicles to the public."[7]

• In 1980, the *Washington Post* claimed "practical electric cars can be built in the near future," and that by 2000, the average family would own cars "tailored for the purpose for which they are most often used." It went on to say that "In this new kind of car fleet, the electric vehicle could pay a big role – especially as delivery trucks and two-passenger urban commuter cars. With an aggressive production effort, they might save 1 million barrels of oil a day by the turn of the century."[8]

• In 2014, Tony Seba, an author who is currently a lecturer in "entrepreneurship, disruption, and clean energy" at Stanford University, declared, "By 2025, gasoline engine cars will be unable to compete with electric vehicles." He continued, claiming that internal combustion engine (ICE) vehicles "are toast."[9]

The facts show something different. The ICE vehicle isn't "toast." ICE automobiles continue their overwhelming dominance in the marketplace. In 2023, EVs accounted for about 9% of all new car sales in the U.S. While that percentage has increased significantly over the past few years, and EV sales are growing, it is also clear that EVs face substantial resistance from automobile buyers.

Auto dealers call EV mandates "unrealistic;" Half of EV sales are happening in heavily Democratic counties.

While the federal government can mandate automakers to build EVs, it cannot — at least not yet — force consumers to buy them. The result is that some of America's biggest automakers are losing staggering amounts of money on the EVs they sell. Other automakers are throttling back plans to produce them. As I reported on Substack in October:

> Ford reported an operating loss of $1.3 billion in its EV division during the third quarter. That translates into a loss of $62,016 for each of the 20,962 EVs it sold during the period. That's a smaller loss than the company recorded in the second quarter, when it lost $72,762 for each EV and the $66,446 it lost per EV during the first quarter. In a press release, the company said the $1.3 billion loss was "attributable to continued investment in next-generation EVs and challenging market dynamics." It also cited "EV price pressure." Those "market dynamics" and price pressures are resulting in knee-buckling losses. The third-quarter loss on the EV business of $1.3 billion, combined with a $1.1 billion second-quarter EV loss and a first-quarter EV loss of $722 million, means that FoMoCo has already lost about $3.1 billion on its EV business this year. As I noted in these pages in July, the company said it expected to lose $4.5 billion on its EV business in 2023.[10]

Also in October, Reuters reported that Honda and General Motors "were ending a $5 billion plan to develop lower-cost EVs together just a year after announcing the effort." The article continued, noting that GM said it "would focus near-term EV efforts on meeting demand rather than hitting specific volume targets."

In November, nearly 3,900 automobile dealers from across the country sent a letter to President Biden telling him that EV demand is "not keeping up with the large influx of BEVs arriving at our dealerships prompted by the current regulations. BEVs are stacking up on our lots." The letter, which has now been endorsed by some 4,467 dealerships, continued, saying EVs are "not selling nearly as fast as they are arriving at our dealerships — even with deep price cuts, manufacturer incentives, and generous government incentives. While the goals of the regulations are admirable, they require consumer acceptance to become a reality. With each passing day, it becomes more apparent that this attempted electric vehicle mandate is unrealistic based on current and forecasted customer demand."[11]

The hard reality is that EVs have long been a niche-market product rather than a mass-market one. Further, that niche market is primarily defined by class and ideology. Some 57% of EV owners earn more than $100,000 annually, 75% are male, and 87% are white.[12] Last March, Gallup reported, "a substantial majority of Republicans, 71%, say they would not consider owning an electric vehicle."

Last October, researchers at the University of California, Berkeley, released a remarkable study that found "counties with affluent left-leaning cities" like Cambridge, San Francisco, and Seattle "play a disproportionately large role in driving the entire national increase in EV adoption."[13] The researchers found that over the past decade, about half of all the EVs sold in the U.S. were sold in the most heavily Democratic counties in the country. The summary of the study deserves quoting at length:

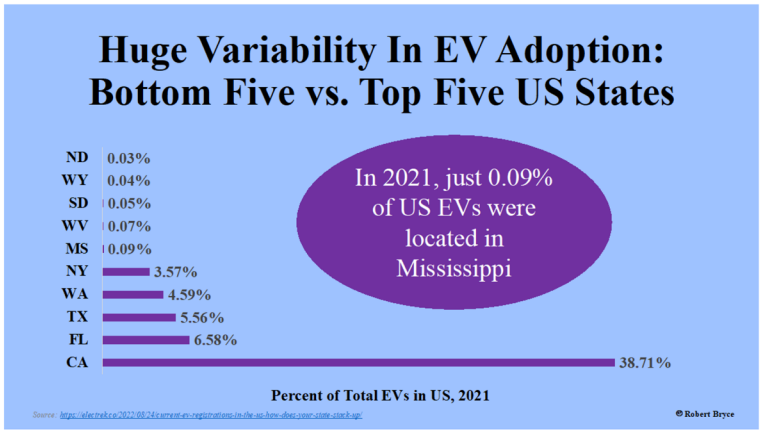
> The prospect for EVs as a climate change solution hinges on their widespread adoption across the political spectrum. In this paper, we use detailed county-level data on new vehicle registrations from 2012-2022 to measure the degree to which EV adoption is concentrated in the most left-leaning U.S. counties. *The results point to a strong and enduring correlation between political ideology and U.S. EV adoption. During our time period about half of all EVs went to the 10% most Democratic counties, and about one-third went to the top 5%. There is relatively little evidence that this correlation has decreased over time, and even some specifications that point to increasing correlation.* The results suggest that it may be harder than previously believed to reach high levels of U.S. EV adoption. (Emphasis added.)

The study concluded that EVs are, despite their long history, still a niche product:

> Many new technologies start off as niche products, appealing only to a relatively small subset of households. But it has now been 14 years since Nissan introduced the Leaf, and 16 years since Tesla introduced the original Roadster. Moreover, there are now over 100 different EV models for sale in the United States. *Enough time has passed — one might have thought — for the U.S. EV market to have broadened considerably. Yet we find a strong and enduring correlation between political ideology and U.S. EV adoption.* About half of all EVs still go to the 10% most-Democratic counties, and despite dramatic growth in the overall size of the market, the correlation in 2022 is actually higher than the correlation in 2012. *Thus, overall, we do not find evidence that the U.S. EV market is broadening across the political spectrum.* (Emphasis added.)

In addition to the concentration of EV sales in liberal cities, there is a vast disparity in EV adoption among the states. In 2022, according to the Department of Energy, about 37% of all the EVs in the country were in California.[14] Thus, out of 2.4 million EVs on American roads at the end of 2022, more than 900,000 were in just one state. Furthermore, about 1.4 million EVs, or roughly 58% of the entire domestic EV fleet, were in just five states: New Jersey, Washington, Texas, Florida, and California.

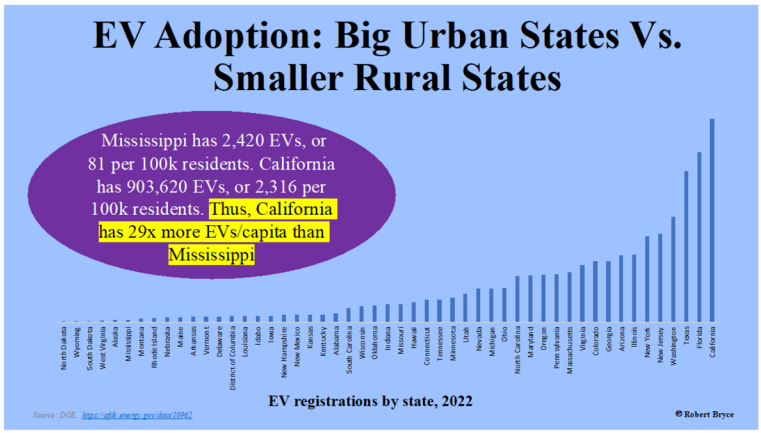
Figure 1



Those numbers show that federal EV policy is slanted to benefit a handful of large, predominantly urban states. And that focus is coming at the expense of lower-

income states like Mississippi. In 2021, just 0.09% of all the EVs in the country were in Mississippi.[15] In 2022, again, according to federal data, California had 29 times more EVs per capita than Mississippi.

Figure 2

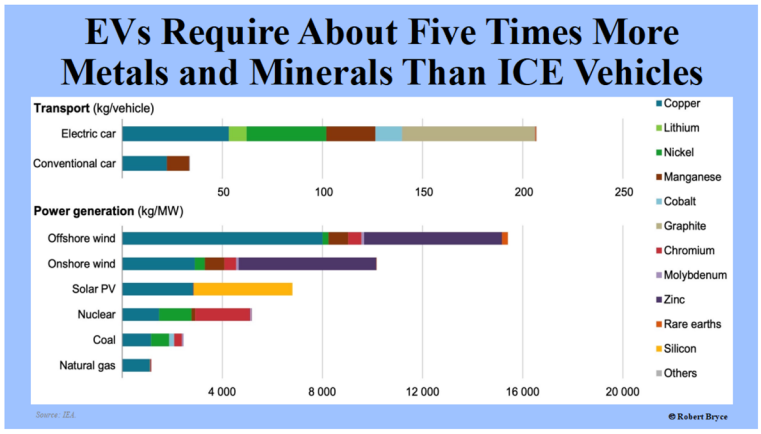


The punchline here is obvious: Ford and the other big automakers have been spending billions of dollars to cater to the whims of a tiny segment of the overall car market — a segment heavily concentrated in a handful of liberal counties. That's a lousy business strategy. But it is an even worse strategy for federal policymakers who must be responsive to the transportation needs of every American, not just those who live in liberal cities and large, wealthy states.

<u>EV mandates will make the auto industry dependent on China.</u>
The EPA's mandates could make the U.S. auto sector reliant on China, which has a stranglehold on the metals, minerals, and magnets needed to produce EVs.

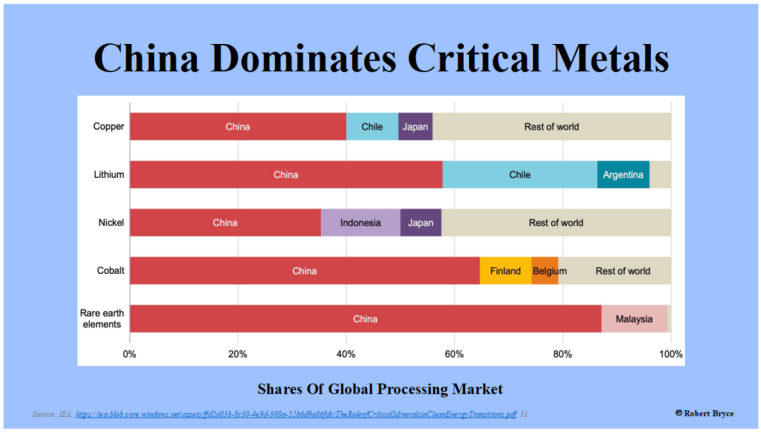
In 2021, the International Energy Agency issued a report detailing China's stranglehold on those commodities. The report includes several vital graphics, including one reproduced in Figure 3, which shows that the resource intensity of EVs is roughly five times greater than what ICE vehicles require.[16]

Figure 3



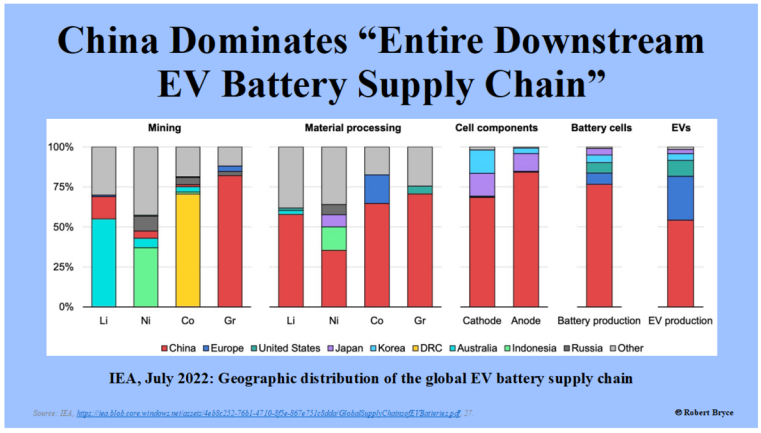
The same report includes a graphic, shown in Figure 4, that illustrates China's dominance of the global processing market for copper, lithium, nickel, cobalt, and rare earth elements. The IEA also reports that the production of lithium, a key ingredient in batteries, "is highly concentrated in a small number of regions, with China accounting for 60% of global production."[17]

Figure 4



In addition, China dominates nearly all of the components needed to make EVs. The graphic in Figure 5 tells the story.

Figure 5



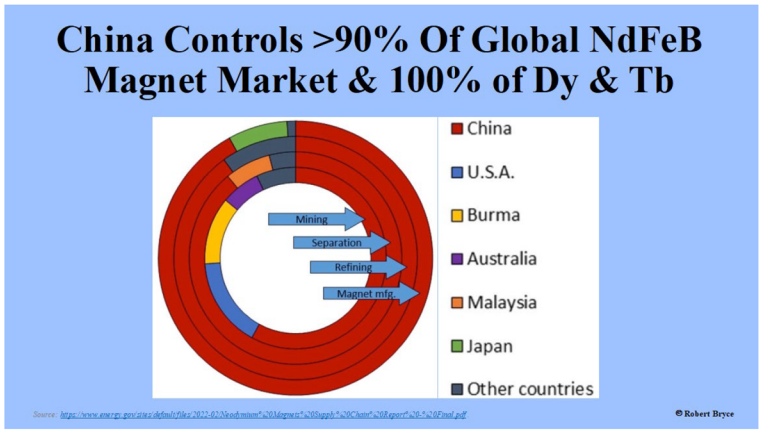
Forcing EVs into the market will also make the U.S. reliant on China for neodymium-iron-boron (NdFeB) magnets. Those magnets are critical components in electric vehicles, wind turbines, and military applications like ship propulsion systems and guided-missile actuators. (They're also used in numerous consumer products, including water pumps, loudspeakers, phones, and refrigeration compressors.)

In the 2021 report, the IEA notes that over 90% of EVs rely on permanent-magnet synchronous motors due to their "high efficiency, compact size, and high power density." The report continues, saying that due to their use of rare earth elements, "such as neodymium, praseodymium, dysprosium, and terbium – upwards of 1 kilogram per motor – raises concerns given the geographical concentration of raw material and processing in China."[18]

While the EPA claims the U.S. needs to ramp up EV production due to concerns about climate change, the Departments of Energy and Commerce have been issuing stark warnings about the national security implications of relying on Chinese magnets. In February 2022, the Department of Energy issued a report titled "Rare Earth Permanent Magnets: Supply Chain Deep Dive Assessment." It said, "Nearly all supply chain stages are concentrated in China and the chemistry associated with processing rare earths is challenging, expensive, and hazardous. Furthermore, substitution is difficult through the supply chain due to the unique characteristics and technical advantage of rare earth magnets."[19]

The image in Figure 6 comes from the DOE's 2022 report. China controls more than 90% of the global market for NdFeB magnets. It also controls 100% of the market for dysprosium (Dy) and terbium (Tb), which are needed to make the magnets operate efficiently in high temperatures.

Figure 6



In September 2022, the Commerce Department issued another report, which was even more dire than the one from the Energy Department. The agency projected that U.S. demand for NdFeB EV magnets would quintuple between 2020 and 2030 to 10,000 tons per year. It further estimated it would hit 23,000 tons per year by 2050. The report also found that America's dependence on imported NdFeB magnets meets the statutory definition of threatening national security.[20]

Here's the key sentence: "Based on the findings in this report, the Secretary concludes that the present quantities and circumstances of NdFeB magnet imports threaten to impair the national security as defined in Section 232 of Trade Expansion Act of 1962, as amended."[21]

It continued, noting that the U.S. "has extremely limited capacity to manufacture NdFeB magnets and is nearly one hundred percent dependent on imports to meet commercial and defense requirements. In 2021, the United States imported 75 percent of its sintered NdFeB magnet supply from China, with nine percent, five percent, and four percent coming from Japan, the Philippines, and Germany, respectively." Despite that finding, as the law firm Mayer Brown noted, the Commerce Department "stopped short of recommending the imposition" of tariffs on magnet imports and instead offered "recommendations to develop and promote a US- and ally-driven supply chain for NdFeB magnets."

As I explained last May on Substack:

> The reason the Biden administration didn't impose tariffs is obvious: Doing so would have raised the cost of EVs at the same time that the climate activists in the administration were pushing for more EV production. But that's only part of the story. The Commerce Department's report clearly shows that it will take years, *or even decades*, before the U.S. and its allies will be able to produce enough magnets to escape China's de facto magnet monopoly. Page 8 of the Commerce report lays out the situation in stark terms: "China dominates all steps of the global NdFeB magnet value chain. In 2020, China controlled about 92 percent of the global NdFeB magnet and magnet alloy market. China also dominated the 2020 upstream value chain steps, controlling about 58 percent of the rare earth mining market, 89 percent of the oxide separation market, and 90 percent of the metallization market." It then provides a telling mention of terbium and dysprosium: "China controls an even higher percentage of the heavy rare earth mining market, including dysprosium and terbium, *which are critical for high-performance NdFeB magnets*."[22] (Emphasis added.)

The Commerce Department report must also be quoted at length:

> China's dominant position in the global NdFeB magnet value chain enables it to set prices at levels that can make production unsustainable for firms operating in market economies. China is the only country with operations in all steps of the NdFeB magnet value chain including upstream (mining, carbonates production, and separation to oxides) and downstream (metal refining, alloy production, and final magnet production) markets. All other countries maintain operations in only some steps of the upstream or downstream magnet value chain...*The NdFeB magnet value chain's fragmentation means that even countries which produce NdFeB magnets remain dependent in part on Chinese inputs.* (Emphasis added.)

In conclusion, the EPA's proposed rule on EVs ignores history. It also ignores the tepid demand for EVs in the marketplace. More crucially, the EPA rule ignores the enormous challenge of ramping up EV production. In 2023, the U.S. manufactured about 15.5 million cars and light trucks.[23] Without so much as a by-your-leave from Congress, the EPA wants to require domestic carmakers to stamp out 10 million EVs per year, and do so in less than a decade. For perspective, that's roughly equal to all of the EVs that were sold globally in 2022. There is simply no

way U.S. automakers can achieve that goal. And even if the target were to be hit, it is obvious that there's not enough consumer demand.

Finally, the EPA rule ignores the impact it would have on automakers' supply chains. China is not our friend. Given the rising tensions with China over Taiwan, North Korea, human rights, and other issues, it makes no sense for the U.S. to make its auto sector dependent on Chinese metals, minerals, and magnets.

The hard reality is that the Biden Administration's EV mandates are bad for U.S. energy security and national security. The mandates are unrealistic and unattainable. They will give China control over critical supply chains and increase costs for consumers and taxpayers. The EPA's EV mandates should be scrapped.

Thank you.

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[1] Author, journalist, film producer, and host of the Power Hungry Podcast. Bryce's latest book is *A Question of Power: Electricity and the Wealth of Nations*. His new documentary is *Juice: How Electricity Explains the World.* For more, see: robertbryce.substack.com
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[17] Ibid, 133.
[18] Ibid., 108.
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Comments on the Department of Treasury December 4, 2023 NPRM regarding the Section 30D Electric Vehicle Tax Credit:

We applaud the Biden-Harris Administration for proposing regulations that would significantly and rapidly decrease our reliance on foreign adversaries for critical minerals and battery components. GreenMet appreciates the opportunity to provide comment to Internal Revenue Service (IRS) and the Treasury of the United States on the Notice of Proposed Rulemaking (NPRM) regarding electric vehicle (EV) tax credits (30D Clean Vehicle Tax Credit). Reshoring America's critical mineral supply chain are energy and national security imperatives.

GreenMet champions cultivating a domestic supply chain of critical minerals by empowering and expanding the American critical mineral industry. Our efforts to reduce U.S. over-reliance on imports of critical minerals and metals—particularly from our adversaries—will serve to strengthen U.S. national security. Critical minerals are the bedrock of our modern technologies, from the lithium and cobalt required for batteries to power everything from our smart phones to electric vehicles, to the gallium and graphite in our computer chips and the neodymium and praseodymium essential to our military aircraft. Essential to our national security, energy sustainability, and economic stability is our ability to ensure reliable and sustainable access to these resources for the United States.

The electric vehicle industry is dependent on critical minerals and rare earth elements (REEs). The definitions and enforcement of this proposed rule will have a significant positive impact on GreenMet, our clients, and the global mineral industry. Ensuring the traceability of the minerals in this supply chain is imperative, especially when foreign adversaries and competitors use abhorrent practices to extract, refine, and process critical minerals. Effective, accountable, and enforceable traceability mechanisms must be in place for the intent of the 30D tax credit to be realized. Without them, what is a seemingly innocuous exclusion for "non-traceable battery materials," becomes a tremendous opportunity for those very market-dominant adversaries we are trying to exclude from benefitting from the credit.

Part and parcel with ensuring that minerals used in American vehicles are manufactured to the highest degree of environmental and labor practice standards is our ability to accurately verify the provenance of critical minerals, battery materials, and battery cells. Equally important is traceability as an important means to preventing taxpayer money from being funneled into adversarial hands. GreenMet supports the proposed rule's purpose to diminish Foreign Entities of Concern's (FEOC) domination of the critical mineral supply chain. However, GreenMet urges the treasury and the IRS to consider only the narrowest of definitions for "non-traceable battery materials." Any definition of non-traceable battery materials should not include any REEs or their constituent oxides or minerals. This will ensure that FOEC's, especially China, do not continue to exploit loopholes that enable them to bypass domestic sourcing requirements, out-

GreenMet

compete domestic alternatives through their market domination and ability to control pricing, and ultimately benefit from the very tax credits intended to keep them out of the supply chain.

By creating the exemptions for non-traceable battery materials that are included in the proposed rule, Treasury removes any incentive for the EV and EV battery industry to lead the supply chain into development of robust critical mineral traceability capabilities. In fact, that very clause has the potential to open a giant loophole for China and other FEOC to continue to profit from U.S. taxpayer dollars. Although some minerals or REEs may account for a small portion of the final battery in terms of price, mass, or weight, their supply chains are incredibly important for energy and national security.

Analogous to the USDA's obligation to be able to trace food supply chains and their regulations requiring that industry comply with complex and comprehensive traceability requirements, Treasury must establish a mechanism to trace minerals and materials. The US must work in partnership with the domestic and allied critical mineral sector and the EV industry to create a viable path forward for critical mineral traceability that prevents the PRC, Russia, and other adversaries from exploiting American interests and profiting off the back of both U.S. consumers and the U.S. taxpayer. While traceability may not be viable or as important for things like plastics, adhesives, and other low value battery components, REEs and critical minerals represent indispensable resources that must have a paper trail from origin to manufacturing.

Excluding FOECs from benefiting from the 30D Clean Vehicle Tax Credit will help incentivize domestic manufacturing of critical minerals and their constituent materials. Re-shoring the critical mineral supply chain will strengthen our economy in a multitude of ways, including bringing back American manufacturing in the critical mineral sector. GreenMet is proud to support domestic supply chains of critical minerals as they seek to provide the U.S. government with the most cost-effective and practical path to a secure an uninterruptable supply chain for heavy rare earths, from mine to separated rare earth oxides. GreenMet, with our relationships across the entire domestic supply chain, would welcome the opportunity to work with this Administration, the industry, and our allies to ensure that such traceability capabilities are robust, complete, and efficient.

Written Testimony for the United States Senate Committee on Energy and Natural Resources

January 11, 2024
10:00 a.m.
Room 366
Dirksen Senate Office Building

Hon. Peter Hoekstra
Peter Hoekstra is a Principal Advisor of the Michigan-China Economic and Security Review. He served as United States Ambassador to the Netherlands from 2018-2021, he previously served on the U.S. House of Representatives House Intelligence Committee from 2001-2011 and represented Michigan's 2nd congressional district from 1993 to 2011.

Hon. Joseph J. Cella
Joseph Cella is the Director of the Michigan-China Economic and Security Review Group. He served as the United States Ambassador to Fiji, Kiribati, Nauru, Tuvalu, and Tonga from 2019-2021.

Mr. Chairman, Mr. Ranking Member, and members of the Senate Committee on Energy and Natural Resources, we are grateful for the opportunity to present our written testimony for this hearing to Examine Federal Electric Vehicle Incentives Including the Federal Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains.

As proposed by the Department of Energy, the *Interpretation of a Foreign Entity of Concern*, leaves the national security of the United States vulnerable, as the guidance is not commensurate with the threat matrix emanating from the People's Republic of China (PRC) and the Chinese Communist Party (CCP), and does not provide for the constitutional charge to "provide for the common defense" of the United States of America. The guidance also is a reckless use of U.S. taxpayer dollars with still evolving technology, low demand for electric vehicles (EVs), and by funding PRC-based and CCP-tied companies, as these entities are necessarily intertwined with the totalitarian regime of our greatest adversary, China.

On 15 February 2023, when serving as Commander of the Office of Naval Intelligence, Admiral Mike Studeman delivered remarks at AFCEA West outlining China challenges entitled "An Intelligence Officer's Prospective on China". He described the China

problem as “More gigantic than understood or appreciated.” This guidance also seems to not fully understand or appreciate the depth, breadth and nature of the China threat. We will address that further later.

The PRC and the CCP are engaged in unrestricted warfare against the United States, and are utilizing any and all means to win, whether militarily, technologically, economically, or academically, including the elite capture of government and business elites.

The tentacles of the reach of the PRC and the CCP begin at the top of their totalitarian regime. Secretary of State Antony Blinken described Chinese companies on CBS’ Face the Nation on 19 February 2023 saying: “…there’s really no distinction between private companies and the state.”

The State Department has warned the Chinese People’s Association for Friendship with Foreign Countries (CPAFFC) is "co-opting subnational governments” and “has sought to...malignly influence state and local leaders to promote the PRC’s global agenda.”

In July 2022, Federal Bureau of Investigation (FBI) Director Christopher Wray declassified the National Counterintelligence and Security Center (NCSC) memorandum containing a warning delivered to a bi-partisan group of state and local elected officials and business leaders that China was aggressively using “seemingly benign business opportunities” for subnational incursions.

Our national security and intelligence agencies cautioned these leaders that these “deals” would be used to further the geopolitical interests of the PRC/CCP, and to “exercise vigilance, conduct due diligence, and ensure transparency, integrity, and accountability are built into the partnership”.

Delivering remarks in recent years, Director Wray, described the China threat in stark terms, whether detailing the FBI opens up, on average, a new China-related counterintelligence investigation every 12 hours, with 2,000 investigations underway. Wray also detailed how the intellectual property theft by China involves “one of the largest transfers of wealth in human history” totaling $225 billion to $600 billion per year. It is unconscionable to make our national security yet more vulnerable by commingling with companies by subsidizing them with US taxpayer dollars, that, by their nature, are commingled with the CCP.

Moreover, the PRC/CCP National Intelligence Law (NIL) requires all PRC citizens, whether at home or abroad, no matter there sector or strata, to surveil, collect and report, as directed, or otherwise, by the Ministry of State Security (MSS).

Appearing before the Select Committee on the Chinese Communist Party on 26 July 2023, former NCSC Director, Bill Evanina, delivered a threat assessment of 100% that

Chinese nationals working for a PRC-based and CCP-tied lithium ion battery plants in the United States would spy for the PRC/CCP.

Evanina further stated: "There will be an effort by the Communist Party of China to infiltrate that capability via cyber, human and hybrid methods using businessmen, engineers and what we call the non-traditional collector. They will go over and above to implement their efforts in that particular technology…"

On 16 August 2023, at a White House press briefing in a question about the controversy surrounding a proposed PRC EV battery plant in Michigan, Senior Advisor to the President for Clean Energy Innovation and Implementation, John Podesta stated "we're actively trying to re-shore our supply chains..we're overly dependent" on China in EV manufacturing, critical minerals, the processing of critical minerals. Podesta later saying: "We're actively working to ensure that we have secure supply chains for these new clean technology products." The current guidance necessarily maintains the United States to be integrated with and dependent on China for this critical technology involving critical minerals, particularly considering 76% of the world's electric battery production is via entities supported or intertwined with the CCP.

Two PRC-based and CCP-tied companies, Contemporary Amperex Technology Limited (CATL) and Gotion (Guoxuan) High Tech Co., Ltd. are seeking to build manufacturing plants in the United States, CATL with Ford in Marshall, Michigan and Gotion in Green Township, Michigan and Manteno, Illinois. Those states are funding these entities with billions of state taxpayer dollars, and would qualify for tax credits under the Inflation Reduction Action (IRA).

It is particularly concerning the CEOs of these companies, Zeng Yuqun, and Li Zhen, respectively, are both members of the Chinese People's Political Consultative Consultative Conference (CPPCC) that is a key coordinating body that convenes representatives of various Chinese interest groups and is led by the Standing Committee of the CCP. The CPPCC also serves as a central component of the party's "United Front" efforts, which is officially tasked with gathering intelligence on, managing relations with, and attempts to influence elite individuals and organizations inside and outside China, often times directly through the founders or leaders of businesses with which they lead.

Reports on these entities suggest either possible violations of the Uyghur Forced Labor Prevention Act (UFLPA) or are also in business partnerships with blacklisted CCP entities or Communist Chinese Military Company Subsidiary. Yet more will soon likely be known about these entities. In light of these revelations, investigations have been underway for several months by three Congressional committees, legislation has been introduced to block engagements with such entities, and individual members in the Senate and House have engaged executive level contacts regarding this grave matter.

Further to understanding and appreciating the depth, breadth and nature of the China threat from these entities, and virtually untrackable activities their executives and employees engage in, we provide the following anecdote.

In February of 2022, Gotion executives, including those who are PRC nationals, toured Ferris State University, near the location of their proposed lithium ion battery manufacturing plant. Those shepherding them around campus were told not to talk with them or ask any questions. Later in that tour the PRC nationals requested a tour of FSU's cybersecurity program, which is one of only two programs in the United States that is backed by the National Security Agency (NSA) and the United States Department of Defense (DOD). Why would PRC nationals in town lobbying for their plant need to tour a program involving space cybersecurity, satellites, communication systems, data analytics, database management and artificial intelligence? In July 2023 the FBI warned American colleges and universities the PRC/CCP were on the hunt for such technology and that they were conducting foreign influence operations to steal such technology from them to advance their own aspirations. And just two days ago, FBI Director Christopher Wray told CNBC's Morgan Brennan during a CNBC CEO Council virtual roundtable: ”You can bet your bottom dollar that foreign adversaries, especially the Chinese, are actively targeting that innovation, that intellectual property.”

The United States is engaged in a second Cold War, now with China, and the federal government should engage accordingly and provide for our common defense, including when it applies to guidance involving FEOCs.

In good conscience and for the sake of our national security, U.S. taxpayer IRA must not fund PRC-based and CCP-tied entities, intertwined with our greatest adversary, China.

Should this policy proceed, we present several modifications.

1. We urge modification of the draft guidance to include FEOCs whose CEOS are members of the CPPCC to be prohibited from receiving tax credits from the IRA.

2. We urge modification of the draft guidance to include FEOC's who are found to have violations of the Uyghur Forced Labor Prevention Act (UFLPA) to be prohibited from receiving tax credits from the IRA.

3. We urge modification of the draft guidance to include FEOC's who have been in, or presently are in, business partnerships with blacklisted CCP entities or a Communist Chinese Military Company Subsidiary, and prohibit them from receiving tax credits from the IRA.

4. We also respectfully request the Department of Energy delays the adoption of the guidance until the Congressional committees conclude their investigations.

We urge you to join with other departments and administration officials in recognizing the threat of Communist China and address it in coordination with them: and further urge you to not show division within the administration, which will raise red flags to Communist China and further impair our national security.

We must never put money over country.

Thank you for your time and consideration.

IER INSTITUTE FOR ENERGY RESEARCH

Senate Energy and Natural Resources Committee

Hearing is to examine federal electric vehicle incentives including the federal government's role in fostering reliable and resilient electric vehicle supply chains.

Comment submitted on behalf of the Institute for Energy Research

Near-term mass adoption of electric vehicles is a central element of the forced green transition sought by the Biden administration and heavily subsidized through the Inflation Reduction Act. But a major impediment to the rapid rollout of many of the energy technologies that would help achieve this forced transition is that they require far more minerals and materials than are currently being produced. As the International Energy Agency (IEA) explains:

An energy system powered by clean energy technologies differs profoundly from one fueled by traditional hydrocarbon resources. Solar photovoltaic (PV) plants, wind farms, and electric vehicles (EVs) generally require more minerals to build than their fossil fuel-based counterparts. A typical electric car requires six times the mineral inputs of a conventional car, and an onshore wind plant requires nine times more mineral resources than a gas-fired plant. Since 2010 the average amount of minerals needed for a new unit of power generation capacity has increased by 50 percent as the share of renewables in new investment has risen.[1]

According to the IEA's "sustainable development scenario," these new energy technologies will require a 42-fold increase in lithium demand, a 25-fold increase in graphite demand, a 21-fold increase in cobalt demand, a 19-fold increase in nickel demand, and a 7-fold increase in rare earth demand by 2040 to meet carbon dioxide emissions goals set by some governments around the world.[2]

New mining projects are not projected to keep up with this incredible increase in demand. For example, EV expert Steve Levine recently argued that "the EV industry is in a decades-long battery metals crisis."[3] He went on to explain that in 2022, lithium and nickel production only support the production of 3.8 million pure EVs, however, automakers said they wanted to make

[1] International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions, May 2021, https://www.iea.org/reports/the-role-of-critical-minerals- in-clean-energy-transitions
[2] International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions, May 2021, https://www.iea.org/reports/the-role-of-critical-minerals- in-clean-energy-transitions
[3] Steve LeVine, Twitter, Apr. 26, 2022, https://twitter.com/stevelevine status/1518913709397131264?s=20&t=VDBSMrbUvCUswbzKJGU_fQ

7.7 million EVs in 2022.[4] Levine used major metals production forecasts and calculated that by 2030 there will only be enough lithium and cobalt for 15.6 million EVs, while automakers say they want to produce over 40 million in 2030.[5] What makes this situation even more unrealistic is that demand for lithium-ion batteries is not just coming from EVs, but also storage on the electrical grid made necessary by part-time renewable energy sources being mandated and subsidized into the system.

Not only are there projected shortages for minerals and materials used for EVs and batteries, but there is a massive project shortfall in necessary copper production as some of the world's largest copper mines have operated for more than a century. S&P Global recently released a report which found that "Unless massive new [copper] supply comes online in a timely way, the goal of net zero emissions by 2050 will be short- circuited and remain out of reach."[6] S&P Global projects that copper demand would have to double between now and 2035 to meet the goal of net zero by 2050.

The increase in demand for these minerals and materials will put upward pressure on prices. For example, according to Benchmark Minerals Intelligence, from April 2021 to April 2022, the raw materials that constitute NCM (nickel, cobalt, magnesium) lithium-ion batteries increased in price by 164 percent, and the raw materials that make-up lithium-ion phosphate batteries increased by 393 percent.[7] Prices have since come down, but these types of price swings can be expected to continue given ongoing government subsizidization of electric vehicles.

The problem is not just with minerals and materials shortages, but energy security as well. Russia's leverage over Europe due to its dependence on Russian oil and natural gas is a reminder of the importance of energy security. The United States Geological Survey (USGS) recently estimated that there were 50 minerals critical to the security of the United States. In 2021, imports comprised more than half of the U.S. consumption for 47 of these mineral commodities, and the U.S. was 100 percent net import reliant for 17 of them.
It's not just the U.S. As the IEA has stated, "the production of many energy transition minerals today is more geographically concentrated than that of oil or gas."[8] The processing of these minerals is even more.[9] China is the largest processor of copper, nickel, cobalt, lithium, and rare

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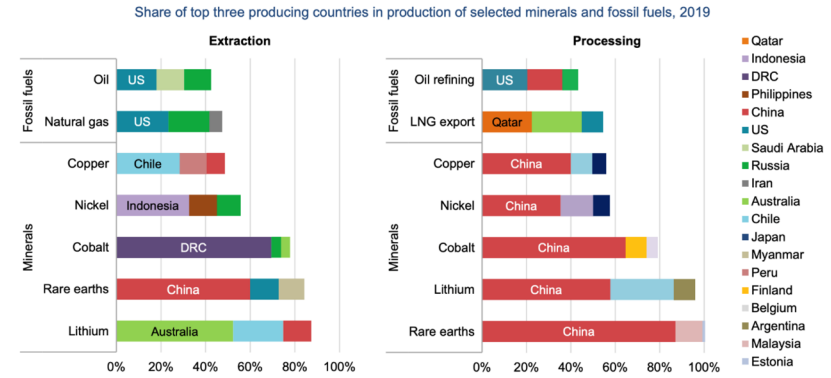
[4] Globally, EV makers sold about 7.6 million battery electric vehicles in 2022. What accounts for the difference? Levine is modeling a standard battery pack. He has explained, "The estimates are pure EVs, not with hybrids, and a standard 90kWh battery. When you use a different mix, such as 55kWh or 75kWh, you can get more production. But the message is the same: lithium and nickel are limiting factors in how many EVs will be made this decade."
[5] Steve LeVine, Twitter, Apr. 24, 2022, https://twitter.com/stevelevine/status/1518378692254310401. See also Steve LeVine, Just How Many EVs Can Be Made? Far Fewer Than Expected, The Electric from The Information, Apr. 24, 2022, https://subscriptions.theinformation.com/newsletters/the-electric/ archive/just-how-many-evs-can-be-made-far-fewer-than-expected
[6] S&P Global, The Future of Copper: Will the looming supply gap short-circuit the energy transition?, p. 9.
[7] Simon Moore's, https://twitter.com/sdmoores/status/1518680838057213952
[8] International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions, May 2021, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions
[9] Ibid.

earth—processing between 35 percent and 85 percent of these minerals. At the moment, the United States and the rest of the world are utterly dependent on China to meet the growing demand for critical minerals and materials necessary for electric vehicles.

The minerals needed for electric vehicles have to come from somewhere, dug up out of the ground and processed into a usable form. Unlike oil and natural gas, which are found and produced around the world, the production of the main battery minerals is quite concentrated. In 2019 for example, the top three extractors of copper and nickel produced more than half of global production, and the top three extractors of cobalt, rare earths, and lithium produced 75-85% of global production. In contrast, the top three producers of oil and natural gas (both of which include the United States) produce less than 50% of global production. But this mining concentration pales in comparison to the concentration in processing, where China dominates.

Production of many energy transition minerals today is more geographically concentrated than that of oil or natural gas



Notes: LNG = liquefied natural gas; US = United States. The values for copper processing are for refining operations.

Source: IEA World Energy Outlook Special Report[10]

China now processes a majority of the world's nickel, cobalt, lithium, graphite, manganese and rare earths, which are key inputs for wind turbines, solar panels, and batteries. For several of those categories, such as graphite, manganese and rare earths, China accounts for 80-100% of global production. China's dominance goes beyond the processing itself; China also controls the manufacturing and production of many green energy products: around 80% of lithium-ion battery cell production; 80-90% of anode and cathode production; between 60-80% of polysilicon, wafers, crystalline silicon cells, and solar modules.

[10] International Energy Agency, *The Role of Critical Minerals in Clean Energy Transitions,* May 2021, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

What all this means is that green energy is truly made in China. Thus, the vast spending from IRA subsidies will be spent on Chinese products and inputs and enrich Chinese companies. Now the IRA did include some incentives to try to produce many of these inputs domestically, but the process of opening a new mine stretches for many years if not decades. And that is assuming all goes well with the permitting and approval process, which has not been the case under the Biden administration, with mines such as Twin Metals and Polymet in Minnesota, Resolution and Rosemont in Arizona, and Pebble and the Ambler Mining District in Alaska, just to name a few prominent examples, all facing obstacles or outright disapproval. The processing of these minerals is also a very dirty and energy-intensive business, which is part of why so much of it is done in China where what minimal environmental standards as may exist are easily ignored if you have the right connections and cheap coal-powered electricity is on offer. Trying to build these processing facilities in the United States will inevitably be stymied by the National Environmental Policy Act or other environmental regulations, to say nothing of the lawsuits from every green organization under the sun (organizations which ironically also support increased use of green energy). Some final assembly of imported Chinese components will probably happen in the US in foreign-owned facilities in order to game IRA subsidy eligibility, but that façade cannot hide what's really happening. To subsidize electric vehicles today is to subsidize China.

None of this is to say that electric vehicles are bad in of themselves. But there is little justification for massive subsidies and mandates for the purchase and use of electric vehicles as a public policy matter. In the near term, subsidies for electric vehicles enrich Chinese suppliers. Mandates that make conventional cars more expensive or less available, combined with the higher costs of electric vehicles, means that it is harder and harder for Americans to afford a vehicles at all. Thus current public policy is subsidizing the Chinese while making the lives of Americans harder.

Instead of hurting Americans and subsidizing Chinese companies, public policy should make it as easy and affordable as possible for Americans to purchase the vehicle that best fits their needs.

IER INSTITUTE FOR ENERGY RESEARCH.

The Economic and Strategic Importance of Domestic Mineral Production

Unlocking the Value of America's Homegrown Mineral Resources

IER INSTITUTE FOR ENERGY RESEARCH.

Prepared by

Institute for Energy Research
1155 15th St. NW, Suite 525
Washington, D.C. 20005

April 2023

INTRODUCTION

The world's energy systems are constantly changing. Over the last three hundred years dramatic shifts in technology have advanced the way we produce and use energy. We saw crude oil replace whale oil for lighting and then electricity replace oil. Over a hundred years ago, gasoline and electric vehicles competed to produce the motive power of automobiles. Gasoline won out, but emerging technologies along with government programs have sparked a new competition between gasoline and electric-powered vehicles. For electricity generation in the United States, we have seen the dominance and then decline of coal generation, the advent of nuclear power, a rapid increase in natural gas-fired generation, and a push by federal and state governments to increase the production of wind and solar-generated electricity.

As we look to the future, improvements in technology and increased government involvement in energy markets means we will likely see more electric vehicles (EVs), batteries for storage, solar panels, wind turbines, and increased competitiveness of hydrogen technologies. In addition to improvements in technology, many governments and some businesses around the world are trying to set targets to reach net zero carbon dioxide emissions, which means reducing carbon dioxide emissions to as close to zero as possible so that any remaining emissions are reabsorbed from the atmosphere by oceans, forests, or other plants.[1] The Biden administration, for example, has set a goal for the U.S. to achieve net zero carbon dioxide emissions by 2050.

One of the major impediments to net zero goals and the continued rollout of many of the energy technologies that would help reach them is that they require far more minerals and materials than are currently being produced. As the International Energy Agency (IEA) explains:

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New mining projects are not projected to keep up with this incredible increase in demand. For example, EV expert Steve Levine recently argued that "the EV industry is in a decades-long battery metals crisis."[4] He went on to explain that in 2022, lithium and nickel production only support

1 United Nations, Climate Action: For a livable climate: Net-zero commitments must be backed by credible action, https://www.un.org/en/climatechange/net-zero-coalition
2 International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions, May 2021, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions
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the production of 3.8 million pure EVs, however, automakers said they wanted to make 7.7 million EVs in 2022.[5] Levine used major metals production forecasts and calculated that by 2030 there will only be enough lithium and cobalt for 15.6 million EVs, while automakers say they want to produce over 40 million in 2030.[6] What makes this situation even more unrealistic is that demand for lithium-ion batteries is not just coming from EVs, but also storage on the electrical grid made necessary by part-time renewable energy sources being mandated and subsidized into the system.

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The problem is not just with minerals and materials shortages, but energy security as well. Russia's leverage over Europe due to its dependence on Russian oil and natural gas is a reminder of the importance of energy security. The United States Geological Survey (USGS) recently estimated that there were 50 minerals critical to the security of the United States. In 2021, imports comprised more than half of the U.S. consumption for 47 of these mineral commodities, and the U.S. was 100 percent net import reliant for 17 of them.

It's not just the U.S. As the IEA has stated, "the production of many energy transition minerals today is more geographically concentrated than that of oil or gas."[9] The processing of these minerals is even more.[10] China is the largest processor of copper, nickel, cobalt, lithium, and rare earth—processing between 35 percent and 85 percent of these minerals.

At the moment, the United States and the rest of the world are utterly dependent on China to meet the growing demand for critical minerals and materials necessary for our energy. That doesn't have to be the case in the future. Over the last 15 years, the United States changed the world's energy landscape by dramatically increasing our production of oil and natural gas. In 2012, President Obama would tell anyone who would listen that it was "stupid" to think that the United States could lower oil prices by drilling for more oil.[11] He argued that "drill, baby, drill" was just a bumper sticker and wouldn't work.

President Obama was wrong. Drill, baby, drill—or simply access to and the production of our vast oil and gas resources—was an energy strategy that worked to lower oil, gasoline, and natural gas prices. Over the past decade, U.S. oil production doubled. Not only that, but the United States became the largest liquefied natural gas (LNG) exporter to Europe, enabling Europe to do without Russian natural gas. Europe's energy crisis would be far worse without the U.S. ramp-up in exports of LNG.

Just as "drill, baby, drill" worked for oil and natural gas production, "mine, baby, mine" can work for minerals. However, the Biden administration is working to stifle any new mining in the United States. Just to name a few examples, the Biden administration has stymied development of the Twin Metals and Polymet mines in Minnesota, the Resolution and Rosemount mines in Arizona, and the Pebble Mine in Alaska. They have also reduced access to the Ambler Mining District in Alaska. The Biden administration has been more disposed toward lithium mines, such as Rhyolite Ridge and Thacker Pass, but actual construction has only begun at Thacker Pass.

If the Biden administration wants to achieve its net zero goals, it should be aggressively working to open more mines in the United States as well as improving our processing capabilities. But they are not. It is possible that the Biden administration hates new mines more than they hate new oil and gas production.

We need a path forward to enable entrepreneurs to do for minerals what they have done for U.S. production of oil and natural gas. In essence, we need to "mine, baby, mine."

5 Globally, EV makers sold about 7.6 million battery electric vehicles in 2022. What accounts for the difference? Levine is modeling a standard battery pack. He has explained, "The estimates are pure EVs, not with hybrids, and a standard 90kWh battery. When you use a different mix, such as 55kWh or 75kWh, you can get more production. But the message is the same: lithium and nickel are limiting factors in how many EVs will be made this decade."

6 Steve LeVine, Twitter, Apr. 24, 2022, https://twitter.com/stevelevine/status/1518378692254310401. See also Steve LeVine, Just How Many EVs Can Be Made? Far Fewer Than Expected, The Electric from The Information, Apr. 24, 2022, https://subscriptions.theinformation.com/newsletters/the-electric/archive/just-how-many-evs-can-be-made-far-fewer-than-expected

7 S&P Global, The Future of Copper: Will the looming supply gap short-circuit the energy transition?, p. 9.

8 Simon Moore's, https://twitter.com/sdmoores/status/1518680838057213952

9 International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions, May 2021, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

10 Ibid.

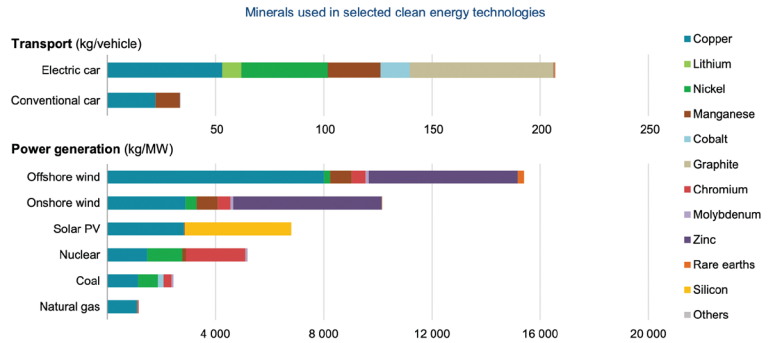
11 President Barack Obama, Obama: 'The American People Aren't Stupid', Feb. 23, 2012, speech at the University of Miami, https://www.youtube.com/watch?v=wyFX2iM-dSE&ab

THE MASSIVE MINERAL AND MATERIALS REQUIREMENTS FOR WIND, SOLAR, AND EVS

There has been a lot of talk of an energy transition away from oil, natural gas, and coal and toward wind, solar, and EVs. The IEA calls this a "shift from a fuel-intensive to a material-intensive energy system."[12] This new energy system would differ profoundly from the current one fueled by traditional hydrocarbon resources.

For example, a typical electric car requires six times the mineral inputs of a conventional car, and an onshore wind plant requires nine times more mineral resources than a gas-fired power plant. In fact, because of the addition of new wind and solar capacity, since 2010, the average amount of minerals needed for a new unit of power generation capacity has increased by 50 percent.[13]

The rapid deployment of clean energy technologies as part of energy transitions implies a significant increase in demand for minerals



Notes: kg = kilogramme; MW = megawatt. Steel and aluminium not included.

Source: International Energy Agency: The Role of Critical Minerals in Clean Energy Transitions

12 International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions, May 5, 2021, at 28, https://iea.blob.core.windows.net/assets/24d5dfbb-a77a-4647-abcc-667867207f74/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf

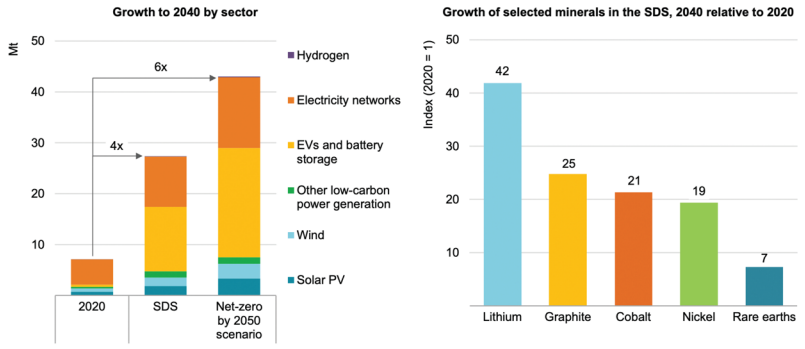
13 International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions, May 5, 2021, https://iea.blob.core.windows.net/assets/24d5dfbb-a77a-4647-abcc-667867207f74/TheRoleofCriticalMineralsinCl eanEnergyTransitions.pdf

As IEA shows below, its sustainable development scenario results in a 42-fold increase in lithium demand, a 25-fold increase in graphite demand, a 21-fold increase in cobalt demand, a 19-fold increase in nickel demand, and a 7-fold increase in rare earth demand by 2040.[14]

The Biden administration is seeking to mandate that 50 percent of new car sales in 2030 be electric, a carbon-free electric grid by 2035, and a carbon-free U.S. economy by 2050. These requirements would put an enormous demand on mining and manufacturing companies for critical minerals and their resulting products. The United States currently has little extraction and processing capability to meet these future demands. The USGS recently estimated that there were 50 minerals critical to the security of the United States. In 2022, imports made-up more than half of the U.S. consumption for 50 of these mineral commodities, and the U.S. was 100 percent net import reliant for 15 of them.

Mineral demand for clean energy technologies would rise by at least four times by 2040 to meet climate goals, with particularly high growth for EV-related minerals

Mineral demand for clean energy technologies by scenario



Notes: Mt = million tonnes. Includes all minerals in the scope of this report, but does not include steel and aluminium.

Source: International Energy Agency: The Role of Critical Minerals in Clean Energy Transitions

14 International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions, May 2021, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

Figure 2 illustrates the reliance of the United States on foreign sources for raw and processed mineral materials.[15]

Figure 2.—2022 U.S. Net Import Reliance[1]

Commodity	Net import reliance as a percentage of apparent consumption	Major import sources (2018–21)[2]
ARSENIC, all forms	100	China, Morocco, Belgium
ASBESTOS	100	Brazil, Russia
CESIUM	100	Germany
FLUORSPAR	100	Mexico, Vietnam, South Africa, Canada
GALLIUM	100	China, Germany, Japan, Ukraine
GRAPHITE (NATURAL)	100	China, Mexico, Canada, Madagascar
INDIUM	100	Republic of Korea, Canada, China, France
MANGANESE	100	Gabon, South Africa, Australia, Georgia
MICA (NATURAL), sheet	100	China, Brazil, Belgium, Austria
NIOBIUM (COLUMBIUM)	100	Brazil, Canada
RUBIDIUM	100	Germany
SCANDIUM	100	Europe, China, Japan, Philippines
STRONTIUM	100	Mexico, Germany, China
TANTALUM	100	China, Germany, Australia, Indonesia
YTTRIUM	100	China, Germany, Republic of Korea, Japan
GEMSTONES	99	India, Israel, Belgium, South Africa
BISMUTH	96	China, Republic of Korea, Mexico, Belgium
NEPHELINE SYENITE	>95	Canada
RARE EARTHS,[3] compounds and metals	>95	China, Malaysia, Estonia, Japan
TITANIUM, sponge metal	>95	Japan, Kazakhstan, Ukraine
POTASH	94	Canada, Russia, Belarus
DIAMOND (INDUSTRIAL), stones	89	South Africa, Congo (Kinshasa), India, Sierra Leone
IRON OXIDE PIGMENTS, natural and synthetic	87	China, Germany, Brazil, Canada
ANTIMONY, metal and oxide	83	China, Belgium, India
CHROMIUM, all forms	83	South Africa, Kazakhstan, Russia, Germany
STONE (DIMENSION)	82	Brazil, China, Italy, India
PEAT	81	Canada
TITANIUM MINERAL CONCENTRATES	81	South Africa, Australia, Madagascar, Canada
ABRASIVES, silicon carbide	79	China, Brazil, Netherlands, South Africa
TIN, refined	77	Peru, Indonesia, Bolivia, Malaysia
COBALT	76	Norway, Canada, Finland, Japan
ZINC, refined	76	Canada, Mexico, Peru, Spain
ABRASIVES, fused aluminum oxide	>75	China, Canada, Brazil, Austria
BARITE	>75	China, India, Morocco, Mexico
BAUXITE	>75	Jamaica, Brazil, Guyana, Turkey
TELLURIUM	>75	Canada, Germany, China, Philippines
GARNET (INDUSTRIAL)	69	South Africa, China, India, Australia
RHENIUM	69	Chile, Canada, Germany, Kazakhstan
SILVER	69	Mexico, Canada, Poland, Chile
PLATINUM	66	South Africa, Germany, Switzerland, Italy
DIAMOND (INDUSTRIAL), bort, grit, dust, and powder	62	China, Republic of Korea, Ireland, Russia
ALUMINA	59	Brazil, Australia, Jamaica, Canada
NICKEL	56	Canada, Norway, Australia, Finland
ALUMINUM	54	Canada, United Arab Emirates, Russia, China
VANADIUM	54	Canada, China, Brazil, South Africa
MAGNESIUM COMPOUNDS	53	China, Israel, Canada, Brazil
GERMANIUM	>50	China, Belgium, Germany, Russia
IODINE	>50	Chile, Japan
MAGNESIUM METAL	>50	Canada, Israel, Mexico, Taiwan
SELENIUM	>50	Philippines, Mexico, Germany, China
TUNGSTEN	>50	China, Germany, Bolivia, Vietnam
ZIRCONIUM, ores and concentrates	<50	South Africa, Senegal, Australia, Russia
SILICON, metal and ferrosilicon	45	Russia, Brazil, Canada, Norway
LEAD, refined	42	Canada, Mexico, Republic of Korea
COPPER, refined	41	Chile, Canada, Mexico
FELDSPAR	39	Turkey, Mexico
SALT	29	Chile, Canada, Mexico, Egypt
PERLITE	28	Greece, China, Mexico
PALLADIUM	26	Russia, South Africa, Italy, Germany
LITHIUM	>25	Argentina, Chile, China, Russia
BROMINE	<25	Israel, Jordan, China
CADMIUM, unwrought	<25	Australia, Germany, China, Peru
MICA (NATURAL), scrap and flake	24	Canada, China, India, Finland
CEMENT	21	Canada, Turkey, Greece, Mexico
VERMICULITE	20	South Africa, Brazil

[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; rare earths, mineral concentrates; sand and gravel, industrial; soda ash; titanium dioxide pigment; wollastonite; zeolites; and zinc, ores and concentrates) or less than 20% net import reliant (beryllium; gypsum; iron and steel; iron and steel slag; lime; nitrogen (fixed)—ammonia; phosphate rock; pumice and pumicite; sand and gravel, construction; stone, crushed; sulfur; and talc and pyrophyllite). For some mineral commodities (hafnium; mercury; quartz crystal, industrial; thallium; and thorium), not enough information is available to calculate the exact percentage of import reliance.

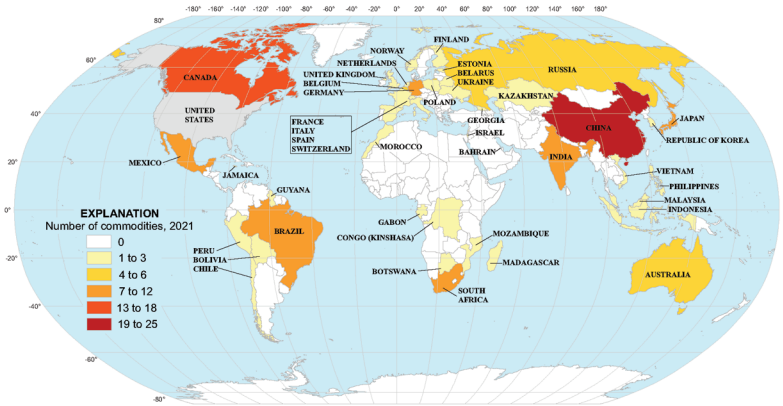
[2]Listed in descending order of import share.

[3]Data include lanthanides.

15 US Geological Survey, Mineral Commodities Summary 2023, https://pubs.usgs.gov/periodicals/mcs2023/mcs2023.pdf

Figure 3 shows the countries that were sources of mineral commodities for which the United States was greater than 50 percent net import reliant in 2022 and the number of mineral commodities for which each highlighted country was a leading supplier. China, followed by Canada, supplied the largest number of these mineral commodities. The countries that were the leading sources of imported mineral commodities with greater than 50 percent net import reliance were: China (26); Canada (20); Germany (14); Brazil (11); South Africa (10); and Mexico (9).[16]

Figure 3 — Major Import Sources of Nonfuel Mineral Commodities for which the United States was Greater than 50% Net Import Reliant in 2021



Source: U.S. Geological Survey Mineral Commodities Summaries 2023

Import dependence on these critical minerals is problematic because it can put supply chains, U.S. companies, and mineral users at risk, particularly when China dominates the mineral supply chains and most of the world's mineral processing.

16 Ibid.

GREEN ENERGY RUNS THROUGH COMMUNIST CHINA

For years many people and organizations argued that the United States needed to reduce its fossil fuel use to reduce dependence on Middle Eastern oil. Since 2019, however, the United States has been essentially self-sufficient in oil production.[17] Nevertheless, some of the same people and groups now want the United States to ignore this fact and transition to electric vehicles. The problem is that the minerals and materials required for EVs, battery storage, and renewables are much more geographically concentrated than oil production is. A single country, China, dominates these supply chains. Even if China were a trustworthy trading partner, which it is not, this would still be a problem because it creates a near-total supply chain dependence on one single country.

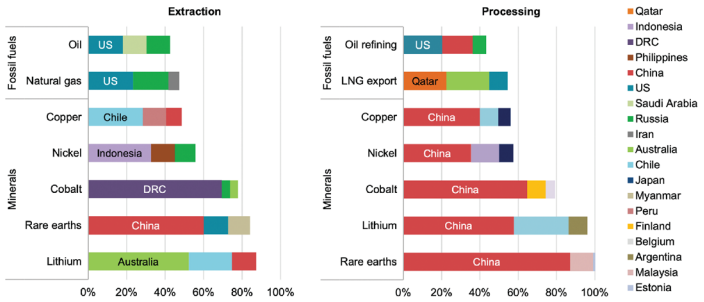
A single country, China, dominates these supply chains. Even if China were a trustworthy trading partner, which it is not, this would still be a problem because it creates a near-total supply chain dependence on one single country.

Due to its massive and cheap coal generation, China processes and refines most of the world's critical minerals. Where it does not have domestic raw materials, China invests in them around the world, most notably in Africa, South America, and Asia. China is even invested in the Mountain Pass rare earth mine in the United States.

The world's top three producing nations control well over three-quarters of the global output of lithium, cobalt, and rare earth elements. In 2019, the Democratic Republic of the Congo and the People's Republic of China were responsible for 70 percent and 60 percent of the global production of cobalt and rare earth elements, respectively.[18] For processing operations, China's involvement was and continues to be even higher. China's share of refining is around 35 percent for nickel, 50 to 70 percent for lithium and cobalt, and almost 90 percent for rare earth elements.[19] That

Production of many energy transition minerals today is more geographically concentrated than that of oil or natural gas

Share of top three producing countries in production of selected minerals and fossil fuels, 2019



Notes: LNG = liquefied natural gas; US = United States. The values for copper processing are for refining operations.

Source: International Energy Agency World Energy Outlook Special Report

17 See Energy Information Administration, 4-Week Avg U.S. Net Imports of Crude Oil and Petroleum Products (Thousand Barrels per Day), https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=wttntus2&f=4

18 International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions, May 5, 2021, https://iea.blob.core.windows.net/assets/24d5dfbb-a77a-4647-abcc-667867207f74/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf

19 Ibid.

means "green" energy runs through Communist China. Chinese companies have made substantial investments in overseas assets in Australia, Chile, the Congo, and Indonesia. China's investments and huge role in processing and refining critical minerals increase the risks that could arise from physical disruption, trade restrictions, or other global developments. For example, in 2010, China cut its rare earth exports by 40 percent and cut off supplies to Japan over a territorial dispute, causing prices to soar.[20]

In 2019, Chinese chemical companies accounted for 80 percent of the world's total output of raw materials for advanced batteries.[21] China controls the processing of almost all the critical minerals—rare earth, lithium, cobalt, and graphite. Of the 136 lithium-ion battery plants in the pipeline to 2029, 101 are based in China. The largest manufacturer of electric vehicle batteries, with a 27.9 percent market share, is China's Contemporary Amperex Technology Co. Ltd founded in 2011.

RARE EARTHS

Rare earth elements are a bit of a misnomer. Rare earths are not that rare in the earth's crust. However, they can only usually be found in small concentrations and are often bonded to other, more abundant, mineral deposits. The biggest challenge with rare earths is the processing required to separate rare earths from other minerals. These separations can be environmentally damaging if costly techniques are not used. Expensive environmental control technology is one reason less rare earth separations are done in the United States over the past few decades and more are done in China. China is one of the world's leaders in rare earth separations on an industrial scale.

Rare earth elements and minerals loaded on cargo ship in China.

Worldwide reserves of rare earths total about 120 million metric tons.[22] Of that amount, 44 million metric tons, or 34 percent, are located within China. After China, the major rare earth countries based on reserve volume are Vietnam, Brazil, and Russia. The United States also has some reserves, estimated at 1.8 million metric tons. In 2022, China was the world's largest producer of rare earths, producing 210,000 metric tons, or 70 percent of the world's production.[23] While China produces most of its rare earths in the southeastern part of the country, in the provinces Jiangxi and Fujian, rare earth production also occurs in Inner Mongolia and Sichuan. In 2022, the United States produced about 43,000 metric tons of rare earth minerals—a fifth of what China produced.[24] Those minerals were almost exclusively processed into end materials in China.

In addition to rare earths, the manufacturing of lithium-ion batteries depends on key materials like graphite, cobalt, manganese, and nickel. In 2022, China produced 65 percent of the world's graphite and has 16 percent of the world's reserves. [25]

COBALT

China has only 2 percent of the world's cobalt reserves,[26] but China owns eight of the 14 largest cobalt mines in the Democratic Republic of Congo, and they account for about half of the country's output.[27] China dominates in the processing of raw cobalt, where raw material is turned into commercial-grade cobalt metal, refining over 80 percent of the world's product. An American company once owned the largest mine in the Congo, but sold it in 2016 to China Molybdenum.

20 Institute for Energy Research, Rare Earth Elements: What Are They? Who Has Them?, July 27, 2016, https://www.instituteforenergyresearch.org/renewable/rare-earth-elements/
21 Voa News, How China Dominates Global Battery Supply Chain, September 1, 2020, https://www.voanews.com/a/silicon-valley-technology_how-china-dominates-global-battery-supply-chain/6195257.html
22 Statista, Reserves of Rare Earths Worldwide, as of 2022, February 28, 2023, https://www.statista.com/statistics/277268/rare-earth-reserves-by-country/
23 Ibid.
24 Ibid.
25 U.S. Geological Survey, Mineral Commodity Summaries 2023, https://pubs.usgs.gov/periodicals/mcs2023/mcs2023.pdf
26 Ibid.
27 Voa News, How China Dominates Global Battery Supply Chain, September 1, 2020, https://www.voanews.com/a/silicon-valley-technology_how-china-dominates-global-battery-supply-chain/6195257.html

LITHIUM

China is among the top five countries with the most lithium resources,[28] and it has been buying stakes in mining operations in Australia and South America, where large lithium reserves are located. China's Tianqi Lithium owns 51 percent of the world's largest lithium reserve in Australia.[29] In 2018, the company became the second-largest shareholder in Sociedad Quimica y Minera—the largest lithium producer in Chile.[30] Another Chinese company, Ganfeng Lithium, has a long-term agreement to underwrite all lithium raw materials produced by Australia's Mount Marion mine—the world's second-biggest, high-grade lithium reserve.[31] In 2022, China produced 15 percent of the world's lithium, having 8 percent of the world's lithium reserves.[32]

MANGANESE

China mined only about 5 percent of the world's manganese in 2022,[33] but refined over 90 percent of it.[34] Most manganese supply is concentrated in South Africa, followed by Gabon and Australia. North America produces very little manganese.

NICKEL

Unlike the other minerals, the nickel mining industry is more evenly spread around the world, but China controls most of the chemical processing.[35] Indonesia, due to on-again off-again ore bans, has in the past caused volatility in the nickel market. However, in 2022, it produced 48 percent of the world's total nickel production, about 54 percent more than in 2021, and it has 20 percent of the world's reserves.[36] Russia produced 7 percent of the world's nickel and has 8 percent of the world's reserves.[37] Electric vehicles account for about 7 percent of overall nickel consumption today,[38] but that would skyrocket under plans to electrify vehicles as proposed by President Biden and several leaders of western countries.

COPPER

Copper is another example of a mineral where it looks like demand will far outstrip supply. S&P Global recently released a study calling copper the "metal of electrification." They found:

> The study seeks to quantify the amount of additional copper that will be required by increased electrification and the energy transition—most specifically, the rapid move to electric vehicles (EVs) and renewable electricity and the need for increased electricity infrastructure. It concludes that copper demand will double by 2035 and continue to grow thereafter. On the supply side, it finds how challenging that will be, whether on the basis of current trends or with an unprecedented acceleration of supply from mining and recycling.

Large scale mining of copper in central Chile, region of Coquimbo.

28 U.S. Geological Survey, Mineral Commodity Summaries 2023, https://pubs.usgs.gov/periodicals/mcs2023/mcs2023.pdf
29 Voa News, How China Dominates Global Battery Supply Chain, September 1, 2020, https://www.voanews.com/a/silicon-valley-technology_how-china-dominates-global-battery-supply-chain/6195257.html
30 Fuels and Lubes, Tianqi Lithium's purchase of SQM shares would make Chinese firm world's largest producer of lithium, May 24, 2018, https://www.fuelsandlubes.com/tianqi-lithiums-purchase-of-sqm-shares-would-make-chinese-firm-worlds-largest-producer-of-lithium/
31 SMM News, the sale of shares in the Australian mine involves 57000 tons of lithium concentrate Ganfeng lithium industry to obtain half of the shares, December 21, 2018, https://news.metal.com/newscontent/100913083/%5bsmm-express%5d-the-sale-of-shares-in-the-australian-mine-involves-57000-tons-of-lithium-concentrate-ganfeng-lithium-industry-to-obtain-half-of-the-shares/
32 U.S. Geological Survey, Mineral Commodity Summaries 2023, https://pubs.usgs.gov/periodicals/mcs2023/mcs2023.pdf
33 Ibid.
34 Mining, China's stranglehold on electric car battery supply chain, April 16, 2020, https://www.mining.com/chart-chinas-stranglehold-on-electric-car-battery-supply-chain/
35 Ibid.
36 U.S. Geological Survey, Mineral Commodity Summaries 2023, https://pubs.usgs.gov/periodicals/mcs2023/mcs2023.pdf
37 Ibid.
38 Mining, China's stranglehold on electric car battery supply chain, April 16, 2020, https://www.mining.com/chart-chinas-stranglehold-on-electric-car-battery-supply-chain/

One possible challenge to the future copper supply is the new government of Chile. Chile is the largest copper-producing country in the world, but has recently installed a socialist government. The new government has proposed to increase taxes on mining and possibly to nationalize mining companies. So far, the latter has not worked. BHP Billiton, which operates the world's largest copper mine, is reconsidering investments in Chile.[39]

CHINESE CONTROL OF PROCESSING

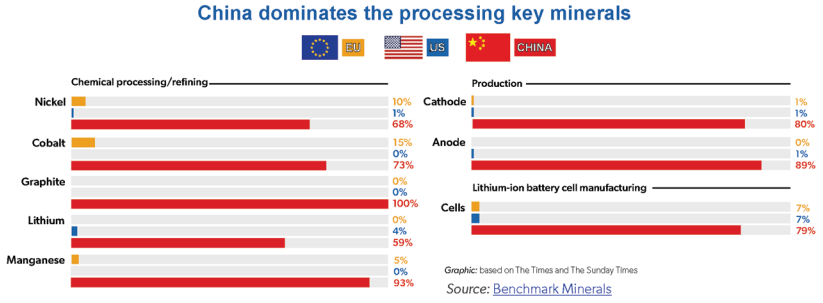
A study by KU Leuven University shows that meeting the European Union's Green Deal goal of "climate neutrality" by 2050 will require 35 times more lithium and 7 to 26 times the amount of rare earth metals compared to Europe's current use.[40] According to the study, besides the increase in lithium and rare earth metals, Europe's energy transition will also require 30 percent more aluminum than what is used currently, 35 percent more copper, 45 percent more silicon, 100 percent more nickel, and 330 percent more cobalt.

That results in massive numbers—about 4.5 million metric tons of aluminum, 1.5 million metric tons of copper, 800,000 metric tons of lithium, 400,000 metric tons of nickel, 300,000 metric tons of zinc, 200,000 metric tons of silicon, 60,000 metric tons of cobalt, and 3,000 metric tons of the rare earths metals neodymium, dysprosium, and praseodymium, which is an increase between 700 and 2,600 percent from current levels.

The report indicates that Europe faces critical shortfalls in the next 15 years without more mined and refined metals supplying its renewable energy system. Because of its rapidly rising energy costs, Europe is currently closing aluminum smelting and other industrial processing just as their governments are pressing for additional renewable energy sources and electrification.

China dominates the United States and Europe regarding critical minerals and will likely continue to do so for the foreseeable future. In 2019, the United Nations Environment Program, UNEP, reported in its "Global Trends in Renewable Energy Investment" that China has outspent every nation when it comes to green research and development. China spent nearly $760 billion between 2010 and 2019 on renewable energy, a figure that's double the $356 billion investment made by the United States, and which surpassed the $698 billion invested by Europe.[41] As a result, China has positioned itself to be the primary supplier of the "clean" economy, as the graph below depicts.

The United States will be competing with Europe for these critical mineral supplies, unless something is done about mining regulations in the U.S.



39 Reuters, Miner BHP may reconsider investments in Chile if tax hikes go forward, July 17, 2022, https://finance.yahoo.com/news/miner-bhp-may-reconsider-investments-143212986.html

40 Mining, Europe's Green Deal requires massive amounts of battery metals—study, May 1, 2022, https://www.mining.com/europes-green-deal-requires-massive-amounts-of-battery-metals-study/

41 Mining, Europe's Green Deal requires massive amounts of battery metals—study, May 1, 2022, https://www.mining.com/europes-green-deal-requires-massive-amounts-of-battery-metals-study/

CHINA'S DOMINANCE OF THE SOLAR PANEL MARKET

U.S. solar developers are highly dependent on China for materials that are instrumental in solar panel production. Whether it be the solar panels themselves, the glass that is needed for bifacial panels, or the polysilicon for the solar cells there are issues dealing with cost, delays, and human rights. Costly disruptions to the solar supply chain are emerging at a time when President Biden is planning on using solar and wind power to meet a mandate of net zero emissions from the generating sector by 2035 and the deployment of 500 million solar panels within 5 years that he touted as a candidate for president.[42]

A critical material needed in solar panel production is polysilicon. Raw polycrystalline silicon,[43] commonly known as polysilicon, is a primary feedstock material used to produce solar cells. Polysilicon feedstock generally consists of large rods which are broken into chunks or chips of various sizes, then cast into multicrystalline ingots. The ingot materials are subsequently sliced into silicon wafers suitable for solar cell production.

China dominates all stages of the solar supply chain, producing between 60 and 80 percent of the world's polysilicon, wafers, crystalline silicon cells, and solar modules.[44] The United States relies almost entirely on Chinese manufacturers for low-cost solar modules, many of which are imported from Chinese-owned factories in Vietnam, Malaysia, and Thailand.[45] China supplies more than 80 percent of the world's polysilicon,[46] of which nearly half comes from Xinjiang, where the Chinese government has mass detentions of minority groups such as Uyghurs and other Muslim minorities.[47] Another 35 percent comes from other regions in China.[48] In 2019, less than 5 percent of the world's polysilicon came from U.S.-owned companies.[49]

China's low-cost, coal-fired electricity has provided the country's solar-panel manufacturers a competitive advantage, allowing them to dominate global markets. Coal-fired electricity rates in the Xinjiang region can be as low as 0.22 yuan ($0.03) per kilowatt-hour, compared with 0.6 to 0.7 yuan in central China.[50] Polysilicon factories refine silicon metal using a process that consumes large amounts of electricity, making access to inexpensive coal power a cost advantage. To support polysilicon manufacturers, China built coal-burning power plants in Xinjiang and Inner Mongolia. Since electricity is 40 percent of the operating cost of manufacturing polysilicon,[51] cheap coal-fired electricity is a goal of its producers. China's cheaper polysilicon production has forced the shutdown of several factories in other countries that use power sources with lower carbon emissions than Chinese producers but with much higher electricity prices.

42 PV Magazine, Biden-Sanders task force calls for 500m solar panels in five years, July 13, 2020, https://www.pv-magazine.com/2020/07/13/biden-sanders-task-force-calls-for-500m-solar-panels-in-five-years/

43 Targray, Polysilicon for Solar PV Manufacturing, https://www.targray.com/solar/solar-silicon/virgin-polysilicon?nowprocket=1#:~:text=Raw%20polycrystalline%20silicon%2C%20commonly%20referred,production%20of%20solar%20cells%20today.

44 New York Times, President Biden extends solar tariffs, with major caveats, February 24, 2022, https://www.nytimes.com/2022/02/04/business/economy/solar-tariffs-caveats.html?searchResultPosition=1

45 CSIS, Solar PV Trade and Manufacturing, February 2021, https://csis-website-prod.s3.amazonaws.com/s3fs-public/Solar%20PV%20Case%20Study%20-%20BloombergNEF.pdf?wDUUIXhfxWtA0ILU66HdshX539MvZHDI

46 New York Times, China's Solar Dominance Presents Biden with an Ugly Dilemma, June 24, 2021, https://www.nytimes.com/2021/04/20/business/economy/china-biden-solar-panels.html

47 New York Times, 'Absolutely No Mercy': Leaked Files Expose How China Organized Mass Detentions of Muslims, November 16, 2019, https://www.nytimes.com/interactive/2019/11/16/world/asia/china-xinjiang-documents.html

48 New York Times, China's Solar Dominance Presents Biden with an Ugly Dilemma, June 24, 2021, https://www.nytimes.com/2021/04/20/business/economy/china-biden-solar-panels.html

49 CSIS, Solar PV Trade and Manufacturing, February 2021, https://csis-website-prod.s3.amazonaws.com/s3fs-public/Solar%20PV%20Case%20Study%20-%20BloombergNEF.pdf?wDUUIXhfxWtA0ILU66HdshX539MvZHDI

50 Bloomberg, Why It's So Hard for the Solar Industry to Quit Xinjiang, February 10, 2021, https://www.bloomberg.com/news/articles/2021-02-10/why-it-s-so-hard-for-the-solar-industry-to-quit-xinjiang

51 Bloomberg, Secrecy and Abuse Claims Haunt China's Solar Factories in Xinjiang, April 13, 2021, https://www.bloomberg.com/graphics/2021-xinjiang-solar/

China has become dominant in the solar manufacturing industry due to its cheap coal, lax environmental standards, government subsidies, and forced labor. Because renewable energy sources, such as wind and solar power, are intermittent and unstable, China's officials indicate that they must rely on a stable power source.[52] They note that coal is readily available, while renewable energy needs to develop further in China despite its dominance in the solar manufacturing arena. China uses coal to make solar panels that it sells to the West, where governments direct and mandate their purchase.

In the Special Report on Solar PV Global Supply Chains,[53] the International Energy Agency warns of the solar PV supply imbalance. China's share in all the key manufacturing stages of solar panels currently exceeds 80 percent and for key elements, including polysilicon and wafers, it is set to increase to more than 95 percent in the coming years based on current manufacturing capacity under construction. This is more than double China's share of global PV demand. For perspective, OPEC's 13 countries produce close to 40 percent of total world oil.[54] That is, China accounts for twice as high a percentage of the world's solar panels as the world depends upon OPEC for oil. In addition, the country is home to the world's 10 top suppliers of solar PV manufacturing equipment. The agency stipulates, "This level of concentration in any global supply chain would represent a considerable vulnerability."

China's share in all the key manufacturing stages of solar panels currently exceeds 80 percent and for key elements, including polysilicon and wafers, it is set to increase to more than 95 percent in the coming years based on current manufacturing capacity under construction.

Since 2011, China has invested over $50 billion in new PV supply capacity—ten times more than Europe—and created more than 300,000 manufacturing jobs across the solar PV value chain. In 2021, the value of China's solar PV exports was over $30 billion, almost 7 percent of China's trade surplus over the last five years. In addition, Chinese investments in Malaysia and Vietnam made these countries major exporters of PV products, accounting for around 10 percent and 5 percent, respectively, of their trade surpluses since 2017. The total value of global PV-related trade—including polysilicon, wafers, cells, and modules—exceeded $40 billion in 2021, an increase of over 70 percent from 2020.

According to the IEA, meeting international energy and climate goals requires the global deployment of solar PV to grow on an unprecedented scale, which demands a major additional expansion in manufacturing capacity, raising concerns about the world's ability to rapidly develop resilient supply chains. Annual additions of solar PV capacity around the world need to more than quadruple to 630 gigawatts by 2030 to be on track with the IEA's pathway to reach net zero emissions by 2050. Global production capacity for the key building blocks of solar panels—polysilicon ingots, wafers, cells, and modules—would need to more than double by 2030 from today's levels, and existing production facilities would need to be modernized.

High commodity prices and supply chain bottlenecks have led to an increase of around 20 percent in solar panel prices. These bottlenecks—particularly apparent in the market for polysilicon—have resulted in delays in solar PV deliveries across the globe and higher prices. Because PV production is largely concentrated in the provinces of Xinjiang and Jiangsu, where coal accounts for more than 75 percent of the annual power supply and benefits from favorable government tariffs, coal generates over 60 percent of the electricity used for global solar PV manufacturing—nearly twice its share of global power generation. Ironically, China's solar PV manufacturing industry owes its success to cheap coal-fired generation.

The IEA report finds that new solar PV manufacturing facilities along the global supply chain could attract $120 billion worth of investment by 2030. According to the report, the solar PV sector has the potential to double the number of direct PV manufacturing jobs to about one million by 2030, with the most job-intensive areas in the manufacturing of modules and cells.

The IEA stresses that governments need to address the level of geographical concentration in global supply chains immediately if they intend to

52 CNBC, China Has 'No Other Choice" But to Rely on Coal Power for Now, Official Says, April 29, 2021, https://www.cnbc.com/2021/04/29/climate-china-has-no-other-choice-but-to-rely-on-coal-power-for-now.html
53 International Energy Agency, Solar PV Global Supply Chains, July 2022, https://www.iea.org/reports/solar-pv-global-supply-chains
54 Council on Foreign Relations, OPEC in a Changing World, March 9, 2022, https://www.cfr.org/backgrounder/opec-changingworld?gclid=EAIaIQobChMIxczZ_Yzp-AIVrsqUCR1kMgCIEAAYAiAAEgK6IvD_BwE

meet their net zero goals. China has been and will continue to be the leader in solar PV panels, particularly as President Biden takes cues from environmentalists to block critical mineral mines in the United States.[55] The United States is way behind and slipping further as President Biden continues to implement his "no action" policies for renewable energy supply chains.

CRITICAL MINERAL PRICES ARE SKYROCKETING

Increased demand and constrained supply are causing energy transition minerals to dramatically increase. Nickel, lithium, copper, and other minerals' prices are rising, and there isn't a new supply readily available to balance supply and keep prices lower. Likely due to concerns about Environmental, Social, and Corporate Governance (ESG), a term that refers to investments made in adherence to a set of rules about environmental and social impacts, companies have been spending less on mining expansions.

Nickel prices have skyrocketed since Russia's February 2022 invasion of Ukraine amid fears that Russian nickel supplies may be cut off. Nickel prices surged in March 2022, after which trading was temporarily suspended for several days, and new trading restrictions were applied. As a result of the high prices and the suspension of trading, automakers and other companies that need nickel, as well as other battery raw materials like lithium or cobalt, are looking for alternatives to shield against future price shocks. There are known nickel deposits in Canada and the United States in Minnesota. However, President Biden's Department of the Interior revoked existing federal leases for Twin Metals Minnesota to mine copper, nickel, cobalt, and platinum-group elements.[56] Other mines are facing similar problems.

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Establishing new mining operations here or elsewhere will take years, even decades, because of the time needed to develop the infrastructure, acquire permits, and secure financing. Automakers and other big nickel buyers are looking for alternative suppliers, using more recycled material, or switching to battery designs that require less nickel. In the meantime, consumers will have to pay higher prices for goods that require nickel, including goods made from stainless steel. The nickel price increases in March 2022 would more than double the cost of the 80 pounds of nickel that an average electric car battery needs to $1,750 per car.[57]

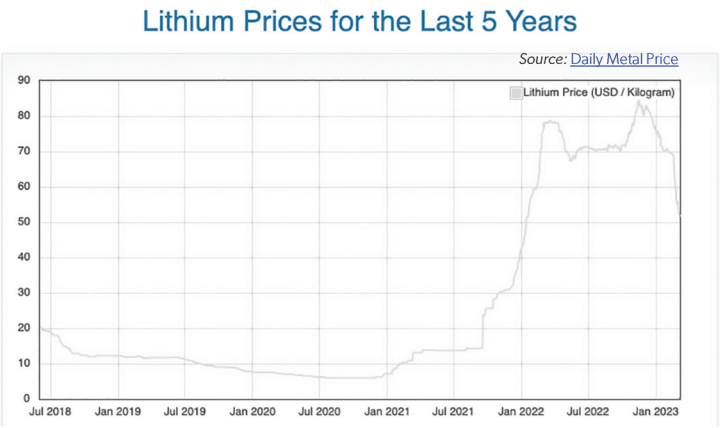
Analysts expect nickel prices to come down to around $25,000 a metric ton compared to the peak of $100,000 a metric ton, and remain much higher than in 2021.[58] The price of nickel topped $20,000 a metric ton after hovering between $10,000 and $15,000 a metric ton for much of the past five years because of limited production due to the pandemic. After Russia invaded Ukraine in late February 2022, the price rose above $30,000 in a little over a week.[59] One month later, Tsingshan Holding Group of China made a bet that the price of nickel would drop. When the price rose, Tsingshan owed billions of dollars. The price then shot up to a little over $100,000 a metric ton,[60] threatening the existence of many other companies that had bet wrong and prompting the London Metal Exchange to halt trading. By January 2023, its price was hovering around $25,000 to $30,000 a metric ton.[61]

The commodity with even greater price increases is lithium. Lithium carbonate in China jumped about 472 percent from a low in June of 2021 to a record high on March 15, 2022, according to Asian Metal Inc.[62] An index of global lithium prices compiled by Benchmark Mineral Intelligence

55 Institute for Energy Research, Biden Invokes Defense Production Act to Boost Domestic Critical Minerals Production, April 6, 2022, https://www.instituteforenergyresearch.org/renewable/bidens-invokes-defense-production-act-to-boost-domestic-critical-minerals-production/
56 Institute for Energy Research, Interior Department Revokes Federal Leases for Twin Metals Minnesota, January 27, 2022, https://www.instituteforenergyresearch.org/regulation/interior-department-revokes-federal-leases-for-twin-metals-minnesota/
57 New York Times, How the War in Ukraine Could Slow the Sales of Electric Cars, March 18, 2022, https://www.nytimes.com/2022/03/18/business/energy-environment/nickel-russia-battery-electric-cars.html?
58 Ibid.
59 Ibid.
60 Ibid.
61 Daily Metal Price, https://www.dailymetalprice.com/metalpricecharts.php?c=li&u=kg&d=240
62 Republic of Mining, The Battery Metal Really Worrying China Is Lithium, Not Nickel, April 4, 2022, https://republicofmining. com/2022/04/04/the-battery-metal-really-worrying-china-is-lithium-not-nickel-by-annie-lee-bloomberg-news-april-2022/

surged almost 490 percent in the past year. Part of the reason for the price increase is that extracting lithium is a cumbersome process. In April 2022, Tesla CEO Elon Musk noted that the price of lithium had gone to "insane levels."[63] In 2022, lithium prices reached over $80 per kilogram.[64] By the middle of March 2023, however, lithium prices eroded to just under $45 per kilogram—still over 4 times higher than in 2020— mostly because demand for the metal has not risen as fast as some in the industry expected.

LITHIUM PRICE (USD/KILOGRAM)



A new reality for President Biden's net zero ambition is that mining companies are not increasing the level of spending that would be needed to meet his and other western countries' goals. Similar to the oil industry, mining companies are responding to pressure from investors to give priority to dividends and share buybacks and to limit the sector's environmental damage, rather than invest in new mines.

Lithium use is exploding due to the growth in electric vehicles and its use in multiple technology industries, including cell phones and mobile computers. Lithium has also become the preferred metal along with other elements including cobalt for batteries. China has largely cornered the market on lithium production due to its own production and its stake in other countries. Other large lithium mines are located in South America and Australia. The United States has 3 percent of the world's lithium reserves, but produces very little of the world's supply.

Joe Lowry, an expert known in mining circles as "Mr. Lithium," has been sounding the alarm on the prospects of a lithium shortage. Since 2012, Lowry has been a consultant to mining companies and an investor, owning shares of companies including Tesla and Lithium Americas. According to Lowry, in the next two years, even

63 Fox Business, Lithium shortages impact Tesla, other EV carmakers, numerous tech markets, April 25, 2022, https://www.foxbusiness.com/markets/lithium-shortages-tesla-ev-tech-markets

64 Daily Metal Price, https://www.dailymetalprice.com/metalpricecharts.php?c=li&u=kg&d=240

though there will be significant growth in lithium supply, it will be less than demand, so the gap will continue to grow. While there will be a day in the future when lithium is in oversupply, it won't be in this decade. A battery factory can be built in two years, but it takes up to a decade to bring on a lithium project.[65]

A new reality for President Biden's net zero ambition is that mining companies are not increasing the level of spending that would be needed to meet his and other western countries' goals. Similar to the oil industry, mining companies are responding to pressure from investors to give priority to dividends and share buybacks and to limit the sector's environmental damage, rather than invest in new mines.[66] Project spending by 10 large mining companies, including Rio Tinto PLC, BHP Group Ltd., and Glencore PLC, is expected to stay at roughly $40 billion in 2023, putting capital expenditures well below a peak in 2012 close to $80 billion.[67] With rising costs for fuel and equipment, higher interest rates, and challenges developing deposits in emerging markets that are seeking a greater share of industry earnings, it is no wonder that many mining companies are being cautious about investing in new mines and infrastructure. [68]

Total global mining capital expenditures, which include smaller firms and state-owned enterprises, averaged about $100 billion annually over the past decade. But mining companies need to spend $160 billion annually to accelerate an energy transition away from hydrocarbons to meet the timelines that politicians want. The low expenditures were the result of a recent rally in copper and iron ore, with both materials up more than 40 percent in the past two years, driving up costs for solar panels, wind turbines, and batteries.[69]

A FURTHER NOTE ON CHINA

China has the willingness and capability to pursue development of the necessary energy and minerals to retain its global dominance. China's "Silk Belt and Road" initiative links and further strengthens trade relations with other nations, most notably for their natural resource wealth.[70] Linking to developing countries by both surface roads and maritime infrastructure, China's initiative extends credit to nations with little economic base who are rich in natural resources that China wishes to develop for future manufacturing, economic, and national security interests. China offers infrastructure investments these nations require, in return for commitments of natural resources in payment.

China's commitment and capabilities to develop the massive infrastructure necessary for economic growth is clear. For example, during just 3 years of the Obama administration, China used 140 percent of the cement used by the United States during the entire 20th century.

China's commitment and capabilities to develop the massive infrastructure necessary for economic growth is clear. For example, during just 3 years of the Obama administration, China used 140 percent of the cement used by the United States during the entire 20th century.[71] China makes over half the world's steel and uses over half the world's coal,[72] almost nine times that of the United States.[73] Clearly, China has the means and—more importantly—the will, to develop these resources and thus spread its influence throughout the globe.

65 Mining, 'Mr. Lithium' warns there's not enough battery metal to go around, April 22, 2022, https://www.mining.com/web/mr-lithium-warns-theres-not-enough-battery-metal-to-go-around/#:~:text=Lithium'%20warns%20there's%20not%20enough%20battery%20metal%20to%20go%20around,-

66 Wall Street Journal, Commodity Prices Have Soared, but Miners Aren't Investing, May 25, 2021,https://www.wsj.com/articles/commodity-prices-have-soared-but-miners-arent-investing-11621940401?mod=article_inline

67 Wall Street Journal, Mining Firms Cautious Spending Threatens Shift to Green Energy, June 19, 2022. https://www.wsj.com/articles/mining-firms-cautious-spending-threatens-shift-to-green-energy-11655566976?st=qewjwqyp6d3iijh&reflink=desktopwebshare_permalink

68 Wall Street Journal, Governments Want to Cash in on Miners' Ballooning Profits, July 12, 2021, https://www.wsj.com/articles/governments-want-to-cash-in-on-miners-ballooning-profits-11626028199?mod=article_inline

69 Wall Street Journal, Inflation Adds to Cost of Clean Energy Transition, December 19, 2021, https://www.wsj.com/articles/inflation-adds-to-cost-of-clean-energy-transition-11639918803?mod=article_inline

70 Council on Foreign Relations, China's Massive Belt and Road Initiative, January 28, 2020, https://www.cfr.org/backgrounder/chinas-massive-belt-and-road-initiative

71 Washington Post, How China used more cement in 3 years than the U.S. did in the entire 20th century, March 24, 2015, https://www.washingtonpost.com/news/wonk/wp/2015/03/24/how-china-used-more-cement-in-3-years-than-the-u-s-did-in-the-entire-20th-century/

72 Foreign Policy, Don't Let China Steal Your Steel Industry, May 19, 2020, https://foreignpolicy.com/2020/05/19/dont-let-china-steal-your-steel-industry/

73 BP Statistical Review of World Energy, July 8, 2021, https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/downloads.html

Further, to meet the Biden administration's goals, substantially more critical minerals will be needed. While the United States is largely dependent on imports currently, it could secure some of these resources by opening mines that are currently having trouble receiving final government approvals. Without increasing the U.S. extraction and processing of these critical minerals, the United States will become more dependent on China for them as China dominates their supply chains. This makes the U.S. much more dependent on China than it ever was on the Middle East for oil. The U.S. imports about 80 percent of its rare earth requirements from China, compared to a high of 23 percent of imported oil from the Middle East in 2001.[74]

China thus sees efforts among western nations, including the United States and Europe, to pursue a "green transition" as a boon to their economy since they are the predominant force in the world in the markets for the materials and minerals necessary for it. As mentioned, they control significantly more of the world's supply of minerals than any nation or group of nations ever controlled the world's oil supplies.

74 Oil Price, How the United States has Reduced Its Dependence on Middle East Oil, January 15, 2020, https://oilprice.com/Energy/Energy-General/How-The-US-Has-Reduced-Its-Dependence-On-Middle-East-Oil.html

MINE, BABY, MINE: THE U.S. CAN INCREASE OUR MINING CAPACITY

The situation with energy and materials for massive increases in renewable energy and EVs looks bleak. However, the not-too-distant past gives us a good example of how new technologies, coupled with a reasonable regulatory environment, have overcome natural resources constraints here in the United States.

Oil and natural gas production in the mid-2000s looked like they were in terminal decline, and federal officials believed that the future of oil and natural gas development in the United States was limited. In 2006, President Bush declared that America was "addicted to oil," and created the renewable fuel standard mandating the use of billions of gallons of biofuels and cellulosic ethanol. President Obama, as late as 2012, said that drilling for more oil as a response to high energy prices was essentially stupid. Specifically, he said, "I mean, the American people aren't stupid. They know that's not a plan—especially since we're already drilling. That's a bumper sticker. It's not a strategy to solve our energy challenge."[75]

As we know today, President Obama was completely wrong. From February 2012 and March 2020, oil production in the United States grew 105 percent and the price of gasoline fell from $3.26 per gallon to $2.53 per gallon.[76]

DRILL, BABY, DRILL WORKED

How did the United States prove both President Bush and President Obama wrong on the potential for oil and natural gas development? The answer was new technology, reasonable regulation, and private ownership of resources.

Starting in the 1970s, the Department of Energy (DOE) and the private sector started working together to attempt to extract hydrocarbon resources from shale formations. [77] The DOE spent millions of dollars to develop various technologies to improve hydraulic fracturing. But advancing the technology was not enough to make these new drilling and fracturing technologies a cost-effective reality. That required something else, which came from the private sector.

The next critical step was real-world experimentation and the regulatory environment played an important role in making this natural gas revolution happen. Entrepreneurs experimented to figure out how to make these drilling and fracturing technologies work in a cost-effective manner.

This experimentation mostly occurred on state and private land and not nearly as much on federal lands. The major difference was—once again—the regulatory environment. One illustrative example of the difference in the regulatory environment is the amount of time necessary to obtain a permit to drill. On federal lands in 2012 it took an average of 307 days to obtain a permit to drill, but only 10 days in North Dakota, 14 days in Ohio, and 27 days in Colorado. The regulatory and permitting morass on federal lands made the necessary experimentation difficult on federal lands.

Marcellus-Shale gas drilling well in Southwestern Pennsylvania.

75 President Barack Obama, Obama: 'The American People Aren't Stupid', Feb. 23, 2012, speech at the University of Miami, https://www.youtube.com/watch?v=wyFX2iM-dSE&ab

76 Energy Information Administration, U.S. Field Production of Crude Oil, https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mcrfpus2&f=m; Energy Information Administration, U.S. All Grades All Formulations Retail Gasoline Prices (Dollars per Gallon), https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMM_EPM0_PTE_NUS_DPG&f=M

77 Breakthrough Institute, https://thebreakthrough.org/issues/energy/where-the-shale-gas-revolution-came-from

The shale revolution was helped along by federal funding to advance technology but hindered by federal regulations on federal lands. As a result, the shale revolution gathered speed almost exclusively on private and state lands in places like Pennsylvania, Texas, North Dakota, Ohio, and Colorado.

WHAT DOES THIS MEAN FOR MINERALS AND MATERIALS?

Is it possible to recreate the oil and gas revolution with minerals and materials? We believe so. The United States provides a good operating environment for mining companies once they are actually operating because of the rule of law and the unlikelihood of the government nationalizing the mines. In much the same way as patents protect intellectual property, private property and its Constitutional protections promote investment and technologies that reward those willing to risk. That said, it is incredibly difficult to permit new mines in the United States, despite enormous geological potential.

If the Biden administration or others are serious about net zero goals not wrecking the economy, then it is critically important that they support the reforms necessary to enable a large increase in new mines and mineral processing in the U.S. With the right regulatory environment, we could see a mining renaissance like the dramatic growth in oil and gas production over the past 15 years, with all of its economic, national security, and geopolitical benefits.

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THE U.S. IS CURRENTLY MOVING IN THE WRONG DIRECTION ON MINING

As this report shows, there will be strong demand for many minerals as EVs continue to enter the market and other energy technologies emerge. The Biden administration has aggressive net zero goals which would greatly increase the demand for these minerals. At the same time, it has been working against allowing the needed new mines in the United States. It is illogical to develop technology that relies heavily on increased mining, while refusing to take any action to develop the capacity for that mining, and choosing instead to block or slow that development wherever possible.

In May 2021, President Biden indicated that he wants to import critical metals, supposedly from allies.[78] However, our European allies are actually temporarily closing mining and processing facilities due to their exceptionally high energy prices and reducing exports to fill the need for critical mineral resources for their own energy transition. As discussed in the previous section, a majority of global lithium production comes from China, Australia, Argentina, and Chile. Russia dominates the global nickel market, and the Democratic Republic of Congo is the world's largest cobalt producer (with half of its large mines owned by China). Child labor is being used to mine cobalt in the Congo and forced labor from Uyghurs and other Muslim minorities is being used in China. As a response to these realities, President Biden released an executive order regarding the domestic mining of these critical minerals.

President Biden talks about wanting domestic production of these minerals, but his actions demonstrate otherwise. His administration has focused on making it more difficult to mine in the United States.

On March 31, 2022, President Biden invoked the Korean War era Defense Production Act (DPA) to attempt to increase domestic production of minerals used in making electric vehicles, such as nickel, lithium, and cobalt, because the country is depending on unreliable foreign sources for many materials necessary for transitioning to the use of renewable energy.[79] The act allows Defense Department (DOD) funding for some early-stage mine development activities. President Biden's order directs the DOD to consider at least five metals—lithium, cobalt, graphite, nickel, and manganese—as essential to national security and authorizes steps to bolster domestic supplies. But President Biden's action does little to increase domestic mining because he did not waive, streamline, or suspend existing regulations. He also failed to address a major hurdle to increased domestic extraction of these critical minerals: the multiple years-long process needed to obtain the necessary federal permits for a new mine.

President Biden talks about wanting domestic production of these minerals, but his actions demonstrate otherwise. His administration has focused on making it more difficult to mine in the United States. It has revoked federal leases; used regulatory action to delay or revoke mining, air pollution, and water quality permits; and labeled a flowering plant "endangered" as ways to delay or cancel metal mines in the United States. Further, a study by finance company MSCI estimates that the majority of U.S. reserves for cobalt, lithium, and nickel are located within 35 miles of Native American reservations, causing a potential conflict with President Biden's stated commitment to racial equity.[80]

In April 2022, the Department of Interior (DOI) reversed a Trump administration decision that limited the scope of compensatory mitigation the Department could force upon projects on federal land as a condition of receiving a permit. This will hit mining projects especially hard.[81] Under

78 FrontPage Magazine, Biden Lied to Miners: "Made in America" Electric Car Metals Will Be Imported, May 25, 2021, https://www.frontpagemag.com/point/2021/05/biden-lied-miners-made-america-electric-car-metals-daniel-greenfield/

79 AP News, Biden order to boost mining may not have quick payoff, April 30, 2022, https://apnews.com/article/biden-technology-business-trending-news-environment-04e20d148dc50c09831d2530d1fd2f8e; New York Times, Biden Invokes Cold War Statute to Boost Critical Minerals Supply, March 31, 2022, https://www.nytimes.com/2022/03/31/business/economy/biden-minerals-defense-production-act.html?campaign_id=4&emc=edit_dk_20220401&instance_id=57307&nl=dealbook&regi_id=63692790&segment_id=87196&te=1&user_id=edd9a99552656979b642d62e6445e311

80 MSCI, Mining Energy-Transition Metals: National Aims, Local Conflicts, June 3, 2021, https://www.msci.com/www/blog-posts/mining-energy-transition-metals/02531033947

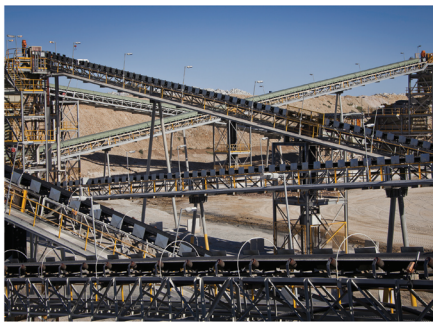
81 United States Department of the Interior, Memorandum, Withdrawal of M-37046 and Reinstatement of M-37039, "The Bureau of Land Management's Authority to Address Impacts of its Land Use Authorizations Through Mitigation", April 15, 2022, https://www.doi.gov/sites/doi.gov/files/m-37075-compensatory-mitigation-m-op-reinstatement-04.15.22.pdf

the new guidance, opponents in the federal government could assess mitigation located far from the project, giving bureaucrats a blank check to request whatever they wish of a permit seeker with little controls or relationship to the project. This decision was made less than a week after the DOI Inspector General reported that there were no controls or apparent records justifying previous versions of this program and warned they may have to review the overall program again.[82]

The following details a few of the critical mineral mines in the United States seeking to obtain permits so that they can begin mining operations, and the obstacles they face from the federal government and environmentalists in doing so.

TWIN METALS MINE

In January 2022, the Biden administration revoked the federal leases for the Twin Metals mine in Minnesota that contains copper, nickel, cobalt, and platinum-group elements.[83] In January 2023, the Biden administration followed that decision by withdrawing more than 225,000 acres of the Superior National Forest from consideration for mining operations for 20 years, thereby ensuring the Twin Metals project's demise for the foreseeable future.[84] The two leases for the Twin Metals mine originated in 1966 and were up for renewal in 2016. In December 2016, however, the Obama administration declined to renew the two leases after a legal opinion from the Interior Department held that Twin Metals did not have an automatic right to renew the leases.[85] The following year, the Trump administration reversed that decision, and the Bureau of Land Management (BLM) subsequently reinstated the leases and then renewed them for an additional ten years.[86] With those leases, Twin Metals formally proposed its mining plans in 2019, which began a multi-year environmental review and permitting process by state and federal regulators.[87] But, in January 2022, a new legal opinion was released by the Biden administration that overturned the Trump administration's actions, revoking the leases.[88] The final straw was the withdrawal of the acreage from the Superior National Forest for two decades. Twin Metals is expected to challenge these decisions and defend its existing mineral rights.



Processing plant at Galaxy Lithium Mine in Ravensthorpe, Western Australia. Mechanical processing used to refine lithium spodumene concentrate.

Since 2010, the Twin Metals mine has invested more than $450 million into the Minnesota economy.[89] The Twin Metals project, once operational, is projected to directly employ 750 people long-term[90]. Furthermore, approximately two spinoff jobs would be created in other industries for each mining job. These spinoff jobs provide new employment opportunities in manufacturing, retail, restaurants, and energy. The Twin Metals project is expected to generate more than 1,500 indirect and induced jobs in goods and services and other sectors, while providing essential minerals for the burgeoning demand expected from President Biden's net zero ambitions.

82 United States Department of the Interior, Weaknesses in the BLM's Compensatory Mitigation Program Data Management, April, 2022, https://www.oversight.gov/sites/default/files/oig-reports/DOI/AuditBLM-CompensatoryMitigationProgramDataMgmt.pdf

83 Institute for Energy Research, Interior Department Revokes Federal Leases for Twin Metals Minnesota, January 27, 2022, https://www.instituteforenergyresearch.org/regulation/interior-department-revokes-federal-leases-for-twin-metals-minnesota/

84 The Federalist, Interior Department Blocks Minnesota Twin Metals Mining Project In Big Win For Beijing, January 26, 2023, https://thefederalist com/2023/01/26/interior-department-blocks-minnesota-twin-metals-mining-project-in-big-win-for-beijing/

85 MPR News, Feds halt Twin Metals plan for Minn. Copper mine near Boundary Waters, December 15, 2016, https://www.mprnews.org/story/2016/12/15/feds-deny-minerals-lease-renewals-for-twin-metals-mine

86 MPR News, Feds reverse course, keep Minnesota copper mine alive, December 22, 2017, https://www.mprnews.org/story/2017/12/22/twin-metals-mn-copper-mine-alive-fed ; MPR News, Interior Department renews leases for Minnesota mine project, May 2, 2018, https://www.mprnews.org/story/2018/05/02/interior-department-renews-leases-for-minnesota-mine-project ; MPR News, Trump administration gives Twin Metals new lease on copper-nickel mining, December 20, 2018, https://www.mprnews.org/story/2018/12/20/feds-move-to-formally-renew-leases-for-twin-metals-mine

87 MPR News, Twin Metals submits formal plans for mine near the boundary water, December 18, 2019, https://www.mprnews.org/story/2018/12/20/feds-move-to-formally-renew-leases-for-twin-metals-mine

88 United States Department of the Interior, Authority to Cancel Improperly Renewed Twin Metals Mineral Leases and Withdrawal of M-37049, "Reversal of M-37036, 'Twin Metals Minnesota Application to Renew Preference Right Leases (MNES-01352 and MNES01353)'", January 25, 2022, https://www.doi.gov/sites/doi.gov/files/m-37072.pdf

89 Jobs for Minnesotans, Jobs & Impact, http://jobsforminnesotans.org/jobs/

90 Ibid.

On May 24, 2022, Congressional Democrats held a hearing on legislation that would permanently ban mining in the Superior National Forest. That was followed by the U.S. Forest Service (USFS) releasing, on June 23, 2022, an environmental assessment recommending a region-wide mining ban on minerals, including copper, nickel, cobalt, and platinum-group elements in the Superior National Forest. The Forest Service included taconite mining in that ban, which northern Minnesotans have been doing safely for the last 130 years and which accounts for 80 percent of all U.S. produced steel.[91] Also, on June 23, 2022, the USFS and BLM announced that they will request public comment on the environmental assessment to withdraw lands from new mineral leasing for 20 years in the Rainy River watershed, which is adjacent to the Boundary Waters Canoe Area Wilderness in the Superior National Forest.[92]

In August 2022, the developers sued the Biden administration to seek the reinstatement of federal mineral rights leases that are crucial to the $1.7 billion project. Twin Metals Minnesota alleged in its lawsuit, filed in federal court in Washington, that the Interior Department acted illegally earlier this year when it canceled the leases. The company asked the court to declare that those leases remain valid and in force, so that it can proceed with the environmental review and permitting process.[93]

Heavy dump truck carrying ore from an opencast mining operation.

POLYMET MINE

Also in Minnesota, the PolyMet copper and nickel mine is being held up by court and regulatory action despite having undergone more than a decade of thorough, public environmental reviews.[94] The PolyMet copper and nickel mine is located within Minnesota's Mesabi Iron Range and would be the first copper-nickel open pit mine in Minnesota. Besides holding significant deposits, the project has existing rail, roads, utilities, and an established supplier network in a traditional mining area where mining has occurred for well over a century.[95] Like other projects in the region, PolyMet has a Project Labor Agreement with building trades unions who are familiar with and expert in mining projects.

The project first entered the environmental review and permitting process in 2005, when George W. Bush was president. Seventeen years later, aspects of the mine's plan and its permits are still being investigated or challenged in court due to environmentalist opposition. According to PolyMet, its mining techniques, water treatment, and waste reclamation plans meet environmental standards and will even improve water quality in the area.

In 2019, PolyMet, under the Trump administration, received all state and federal permits needed to mine for 20 years, but three key permits needed for the project were subsequently suspended or reversed.

One of those is the project's permit to mine—a permit approved by the Minnesota Department of Natural Resources (DNR) that was reversed by the Minnesota Supreme Court in April 2021.[96] PolyMet's permit to mine indicates planned mining and reclamation activities will conclude in about 2072, though long-term maintenance and "active water treatment" will continue indefinitely until state rules on mine closure are met and the need for maintenance ends. The Supreme Court indicated that PolyMet models show "post-closure maintenance" is likely needed for at least 200 years. The DNR will determine a revised date and get public input on it. The court also told DNR that it must hold a "contested case

91 Press Release, Stauber Statement Blasting Biden Administration's Latest Anti-Mining Action, June 23, 2022, https://stauber.house.gov/media/press-releases/stauber-statement-blasting-biden-administration-s-latest-anti-mining-action

92 Press Release, SDA Forest Service Announces Plans to Open Comments on Rainy River Mineral Withdrawal in Northern Minnesota, June 23, 2022, https://www.usda.gov/media/press-releases/2022/06/23/usda-forest-service-announces-plans-open-comments-rainy-river

93 CBS, Twin Metals sues Biden administration to regain mine leases near Boundary Waters, https://www.cbsnews.com/minnesota/news/twin-metals-sues-biden-administration-to-regain-mine-leases-near-boundary-waters/

94 MinnPost, Why 2022 could be a critical year for the controversial PolyMet mining project in northern Minnesota, January 5, 2022, https://www.minnpost.com/greater-minnesota/2022/01/why-2022-could-be-a-critical-year-for-the-controversial-polymet-mining-project-in-northern-minnesota/

95 Minnesota Department of Natural Resources, Minnesota mining history, https://www.dnr.state.mn.us/education/geology/digging/history.html#:~:text=Iron%20ore%20was%20discovered%20on,ore%20out%20of%20the%20rock.

96 State of Minnesota Supreme Court, In the Matter of the NorthMet Project Permit to Mine Application, April, 2021, https://mn.gov/law-library-stat/archive/supct/2021/OPA181952-042821.pdf

hearing" on whether the company's plan to use bentonite, a clay sealant, in its tailings pond as a key pollution prevention strategy would be effective.

PolyMet opponents are also suing state regulators over a water-pollution permit granted by the Minnesota Pollution Control Agency. In June 2021, the federal Environmental Protection Agency (EPA) ruled that discharges from PolyMet may affect water quality, as required by the Clean Water Act.[97] That allowed opponents of PolyMet to object to a federal "Section 404" permit previously granted by the U.S. Army Corps of Engineers (Army Corps) and request a hearing on the issue. The 404 permit is tied to construction-related damage to wetlands including the discharge of dredged and fill material into water. The Army Corps is holding the hearing, but meanwhile, President Biden's EPA has recommended that the permit not be reissued. That ruling by the EPA occurred after President Biden invoked the Defense Production Act, and conflicts with his statements about wanting to develop a domestic critical metals mining industry.[98]

Another issue involves a critical air emissions permit given to the project.[99] The court ruled that the Minnesota Pollution Control Agency had not sufficiently justified granting the permit after opponents raised allegations that PolyMet was planning a much larger mine. A report that PolyMet filed with Canadian regulators suggested that PolyMet was considering expanding the mine to four times the size that the air permit would allow. In December, the Minnesota Center for Environmental Advocacy affirmed the permits, saying in an agency order that there was not enough evidence to prove PolyMet was asking for the smaller permit "in bad faith."[100]

The company expects the roughly $1 billion project to bring 360 direct jobs to the region and more than 600 indirect ones after construction.

IONEER LTD.'S LITHIUM MINE

Ioneer Ltd.'s lithium mine in Nevada, which could supply 22,000 metric tons of lithium annually (enough for about 400,000 electric cars), is being held up by environmentalists, who claim the mine threatens Tiehm's buckwheat, a rare flowering plant.[101] The Trump administration's Interior Department refuted that claim, finding that it was actually squirrels who were threatening the buckwheat. Despite the analysis, environmentalists asked the Biden administration to list the buckwheat as an endangered species. Interior regulators subsequently proposed a listing to that effect. The U.S. Fish and Wildlife Service (USFWS) will permanently zone off 910 acres near Ioneer Ltd's proposed lithium mine to preserve the flower, a major step backward in the project's bid to proceed.[102] The Fish and Wildlife Service indicated in its filing that the zone should "not have a significant economic impact" on nearby business activity. Ioneer believes it can protect the flower, even if it needs to tweak its mine plans.

Pouring hundreds of millions of dollars into a domestic mining industry that remains unable to obtain permits in a timely and rational manner does little to enhance U.S. energy security or facilitate the demand for secure domestic mineral supplies.

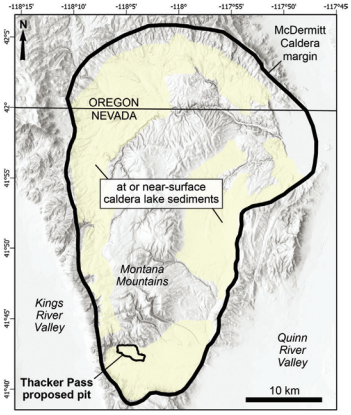
Final approval by BLM is based on a completed environmental review under the National Environmental Policy Act (NEPA), which begins with the public review and comment phase of the NEPA process that will be incorporated in the Environmental Impact Statement (EIS) Plan. The NEPA process culminates in the BLM's Record of Decision (ROD), which is expected in the first quarter of 2024.[103]

97 United States Environmental Protection Agency, PolyMet NorthMet Mine, https://www.epa.gov/mn/polymet-northmet-mine#nextsteps
98 MPR News, EPA recommends Army Corps not reissue PolyMet water permit, May 3, 2022, https://www.mprnews.org/story/2022/05/03/army-corps-of-engineers-holds-hearing-on-controversial-polymet-water-permit
99 AP News, 2nd PolyMet permit complaint reaches Minnesota Supreme Court, November 5, 2020, https://apnews.com/article/environment-minnesota-courts-air-pollution-pollution-00a50365e8717c66eaa48aa7047149f4
100 State of Minnesota Pollution Control Agency, In the Matter of Issuance of Air Emissions Permit No. 13700345-101 for PolyMet Mining, Inc., City of Hoyt Lakes, St. Louis County, Minnesota, December 20, 2021, https://www.pca.state.mn.us/sites/default/files/Findings%20-FactAndConclusionsOfLawDec20-2021.pdf
101 WSJ Opinion, Critical Mineral Contradictions, April 3, 2022, https://www.wsj.com/articles/critical-mineral-green-energy-climate-change-electric-cars-biden-mining-zinc-lithium-copper-china-pollution-endangered-species-defense-production-act-11648850666?st=ileha2hnjvl5tom&reflink=desktopwebshare_permalink
102 Reuters, rare flower to get protected zone near Ioneer's Nevada lithium mine, February 3, 2022, https://www.reuters.com/business/environment/us-regulators-preserve-acreage-near-ioneers-lithium-mine-site-2022-02-02/
103 PR Newswire, Ioneer's Rhyolite Ridge Project Advances into Final Stage of Permitting, December 19, 2022, https://www.prnewswire.com/news-releases/ioneers-rhyolite-ridge-project-advances-into-final-stage-of-permitting-301706219.html

In normal circumstances, the process of getting a mine to first production can be a 7 to 10 year enterprise.[104] But recalcitrant federal bureaucracies and politics can extend that timeline, as seen by the Twin Metals mine, whose lease began in 1966. Pouring hundreds of millions of dollars into a domestic mining industry that remains unable to obtain permits in a timely and rational manner does little to enhance U.S. energy security or facilitate the demand for secure domestic mineral supplies. This, unfortunately, is the reception those interested in investing in mining in the U.S. are currently accustomed to receiving.

THACKER PASS LITHIUM MINE

The Thacker Pass Lithium Mine is located in Humboldt County, Nevada, about 25 miles from the Nevada-Oregon border. The proposed mine could produce a quarter of today's global lithium demand. This is significant, but demand for the mineral is skyrocketing due to electric vehicle mandates from governments here and around the world. The BLM granted the project its final federal permit in January 2021. The mine's development, however, is still on hold, due to legal challenges. On February 25, 2022, the final state-level permits (air, water, and mining) required for the proposed Thacker Pass Lithium Mine Project were issued, moving it a step closer to operation.[105] As part of the decision, no mining will be allowed below the water table.



Proposed boundaries and surrounding areas of the Thacker Pass Project. Courtesy of Lithium Americas.

A federal lawsuit was filed by a coalition of nearby indigenous communities, environmental groups, and a local rancher that argued the environmental review downplayed the likely effects on groundwater, streams, and a threatened species of trout.[106] The suit alleges that when the BLM approved the project in January 2021, it was based on a flawed environmental review and rushed through without adequate consultation of tribes, as required by law.[107] The district court ruled in favor of the BLM and Lithium Americas, allowing Lithium Americas to break ground on the project in March 2023.[108]

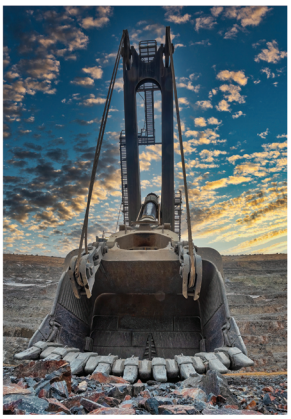
In October 2022, Lithium Americas Corporation, the company developing the mine, entered a Community Benefits Agreement (CBA) with the Fort McDermitt Paiute and Shoshone Tribe, which is located approximately 40 miles from the Thacker Pass project, in Humboldt County, Nevada. The CBA establishes a framework for continued collaboration and defines the long-term benefits for the Tribe, the largest Native American community within the vicinity of the Project. The Company agreed to build an 8,000 square feet community center for the Tribe that includes a daycare, preschool, playground, cultural facility and communal greenhouse to support reclamation efforts and provide income for the Tribe.[109]

Lithium Nevada is expecting to be fully operational in 2024, when the mine is expected to produce 60,000 tons per year of battery quality lithium carbonate over a 46-year life span. The mine will provide over 1,000 construction jobs and 300 permanent jobs. After mining, the open pits will be filled and restored with sagebrush and mine tailings will be placed in dry stacks. The mine will consume less than 1 percent of the approximately 350,000 acre-feet of water pumped annually from wells in the county.[110]

104 Forbes, Biden's Efforts to Boost Mining Won't Matter Without Permits, April 4, 2022, https://www.forbes.com/sites/davidblackmon/2022/04/04/bidens-efforts-to-boost-mining-wont-matter-without-permits/?sh=257bf78c6720
105 Nevada Division of Environmental Protection, Thacker Pass Lithium Mine, https://ndep.nv.gov/land/thacker-pass-project
106 Protect Thacker Pass, Native Americans Enter Legal Battle Against Thacker Pass Lithium Mine, July 26, 2021, https://www.protectthackerpass.org/native-americans-enter-legal-battle-against-thacker-pass-lithium-mine/
107 Grist, A controversial lithium mine in Nevada is one step closer to operation, March 2, 2022, https://grist.org/equity/nevada-issues-permits-for-lithium-mine/
108 Hilary Beaumont, Nevada lithium mine breaks ground despite Indigenous opposition, Al Jazeera, Mar. 15, 2023, https://www.msn.com/en-us/news/world/nevada-lithium-mine-breaks-ground-despite-indigenous-opposition/ar-AA18EDIf.
109 Lithium Americas, https://www.lithiumamericas.com/news/lithium-americas-signs-community-benefitsagreement-with-fort-mcdermitt-paiute-and-shoshone-tribe
110 Washington Times, Nevada lithium mine pits Biden green agenda against radical environmentalists, June 13, 2022, https://www.washingtontimes.com/news/2022/jun/13/nevada-lithium-mine-pits-biden-green-agenda-agains/

RESOLUTION COPPER MINE

The Resolution copper mine in Oak Flat, Arizona, which can meet about 25 percent of U.S. copper demand, is currently under federal environmental review.[111] In March 2021, just weeks into the new Biden administration, the federal government rescinded its approval for the copper mine days before it was to transfer thousands of acres of federal land for the project.[112] The land could have been handed over under a congressionally approved swap in which the federal government would have traded 2,422 acres of land to Resolution Copper in exchange for 5,459 acres of other land in southeast Arizona.[113]



Giant shovel of an excavator used in African critical mineral mining operations.

President Biden's Department of Agriculture (USDA) said it ordered the rescission to allow for a "thorough review based on significant input from collaborators, partners and the public" after the January 15, 2021 release of a final environmental impact statement on the project. In ordering the reversal, the USDA cited President Biden's memorandum calling for increased tribal consultation, saying it wanted to ensure "the Forest Service has complied with the environmental, cultural, and archaeological analyses required."[114] Further, in September 2021, the Democratic controlled House Natural Resources committee voted to include language in the House reconciliation package to block the building of the Resolution copper mine. It did not pass the Senate.[115]

In November 2022, the 9th U.S. Circuit Court of Appeals indicated that they will weigh whether the federal government improperly gave Rio Tinto Plc thousands of acres in Arizona for its Resolution Copper mining project, taking into account religious rights versus the needs of the green energy transition. The San Francisco-based court said it will decide the case en banc, meaning all of its 11 members will participate in the decision. Three members of the court previously ruled in favor of Rio and the land swap. The new hearing occurred on March 21, 2023, and a decision will be released in the coming months. The dispute centers on the federally owned Oak Flat Campground, which some Apache consider home to deities and which sits atop a reserve of more than 40 billion pounds of copper.[116]

The proposed mine is expected to create up to 1,450 high-paying jobs and generate about $1 billion a year in direct and indirect economic impact for the state.[117] The project could pump $61 billion into the economy over the projected 60-year life of the mine, annual increases of up to $113 million in state and local taxes, and $200 million in federal taxes.[118] Arizona is the nation's largest copper-producing state and has a very long history with copper mines and mining.

ROSEMONT COPPER MINE

The Rosemont copper mine in the northern Santa Rita Mountains in Arizona received a setback when federal regulators rejected its mining company's request to reduce critical habitat for jaguars deemed endangered on land that overlaps the footprint of the proposed mine.[119] Hudbay Minerals Inc. has been working for more than a decade to open the mine which would create thousands of jobs and bring billions in economic development to the region. The mine only needed about 6 percent of the land that had been excluded for the jaguars.

111 Nation World News, US House committee moves to block Rio Tinto's resolution mine, December 9, 2021, https://nationworldnews.com/us-house-committee-moves-to-block-rio-tintos-resolution-mine/
112 Cronkite News, Feds rescind OK for copper mine at Oak Flat, seek 'thorough review', March 1, 2021, https://cronkitenews.azpbs.org/2021/03/01/feds-rescind-ok-for-copper-mine-at-oak-flat-seek-thorough-review/
113 Ibid.
114 United States Department of Agriculture, Resolution Copper Project and Land Exchange Environmental Impact Statement, https://www.resolutionmineeis.us/
115 AZ Mirror, How the House reconciliation bill scraps Resolution Copper mine in Oak Flat, September 13, 2021, https://www.azmirror.com/2021/09/13/how-the-house-reconciliation-bill-scraps-resolution-copper-mine-in-oak-flat/
116 Reuters, Full 9th US Circuit to tackle complex Resolution Copper mining case, November 18, 2022, https://www.reuters.com/markets/commodities/full-9th-us-circuit-tackle-complex-resolution-copper-mining-case-2022-11-18/
117 Cronkite News, Feds rescind OK for copper mine at Oak Flat, seek 'thorough review', March 1, 2021, https://cronkitenews.azpbs.org/2021/03/01/feds-rescind-ok-for-copper-mine-at-oak-flat-seek-thorough-review/
118 Resolution Copper, Myths and Facts, https://resolutioncopper.com/myth-and-facts/
119 Cronkite News, Feds deal another setback to Rosemont mine by upholding jaguar habitat, September 3, 2021, https://cronkitenews.azpbs.org/2021/09/03/feds-deal-another-setback-to-rosemont-mine-by-upholding-jaguar-habitat/

Further, Tucson Arizona officials are trying to block operators of the Rosemont copper mine from storing water in a recharge facility the city co-owns. The contract would allow Rosemont to store up to 1,124 acre-feet of water—about 366 million gallons—at the facility each year from 2022 to 2032.[120] Hudbay Minerals Inc. pledged to return some of the 1.7 billion gallons of groundwater it plans to pump each year back into the aquifer. The city is considering options that include diverting water from its other recharge facilities to block Rosemont or take legal action.

The original proposed Rosemont mine is estimated to be a $2 billion open-pit mining project and would add up to 2,500 jobs in an area with a high poverty rate for the 19 years where the mine is set to operate.[121]

In April 2022, it was announced that a Hudbay Minerals Inc. subsidiary will begin clearing and grading private land on the Santa Rita Mountains' western slope south of Tucson for a planned new mine with five open pits.[122] Pima County regional flood control officials were notified that the company plans to start seeking environmental permits from state agencies for construction of the Rosemont Copper World project. Hudbay said it would strive to minimize environmental disturbances and comply with all government requirements.

The organization Earth Justice has been fighting the Rosemont mine project since 2017, representing Indian Tribes that claim to have burial grounds in the area. Earth Justice sought a preliminary injunction to stop any digging from starting at the eastern mine. Instead of granting a preliminary injunction, the judge ruled on the merits of the Tribes' case, holding that the Forest Service made a "crucial error" by assuming Hudbay Minerals had a right to use public lands without any evidence of a valuable mineral deposit, and that this error "tainted the Forest Service's evaluation of the Rosemont Mine from the start." The judge prevented any mining activities from going forward, and called out the Forest Service for abdicating its duty to protect our public lands.[123]

Heavy dump truck carrying ore from an opencast mining operation.

PEBBLE MINE

The Pebble copper and gold mine on state lands 100 miles from Bristol Bay, Alaska, had its permit application rejected in November 2020 by the Army Corps[124][125]. The Pebble Mine also is rich in two important rare earth minerals, palladium and rhenium. It contains enough rhenium to supply the entire world's needs for nearly half a century.[126] Rhenium is used in the construction of military jet engines and as a catalyst in high-octane fuel combustion.[127]

In January 2021, the Pebble Partnership requested the Army Corps to reverse its denial of the proposed mine's Clean Water Act dredge and fill permit. According to Northern Dynasty Minerals, that decision is receiving new oversight and is likely to take a year or longer.[128] However, Biden's EPA indicated that, depending on the outcome

120 AZ Central, Tucson digs in against Rosemont copper mine in a dispute over a water storage project, January 31 2022, https://www.azcentral.com/story/news/local/arizona-environment/2022/01/31/tucson-uses-dispute-over-water-recharge-renew-rosemont-opposition/9247404002/

121 9 KGUN Tucson, Federal judge throws out approval to start construction on the Rosemont Mine, July 31, 2019, https://www.kgun9.com/news/local-news/federal-judge-throws-out-approval-to-start-construction-on-the-rosemont-mine ; AZ Central, Tucson digs in against Rosemont copper mine in a dispute over a water storage project, January 31, 2022, https://www.azcentral.com/story/news/local/arizona-environment/2022/01/31/tucson-uses-dispute-over-water-recharge-renew-rosemont-opposition/9247404002/

122 Tucson.com, Hudbay to clear land near Tucson for goal of 5 open-pit mines, April 6, 2022, https://tucson.com/news/local/subscriber/hudbay-set-to-clear-land-near-tucson-for-goal-of-5-open-pit-mines/article_82f4edb2-b21a-11ec-9637-0fe54ce05803.html

123 EarthJustice, Tribes Halt Major Copper Mine on Ancestral Lands in Arizona, November 7, 2022, https://earthjustice.org/blog/2019-november/rosemont-mine-arizona-tribes-Tohono-Oodham

124 Mining News North, Pebble Mine Death Grossly Exaggerated, August 24, 2020, https://www.miningnewsnorth.com/story/2020/08/28/news/pebble-mine-death-grossly-exaggerated/6415.html

125 National Fisherman, Pebble Mine owners discuss delay in appeals process, August 17, 2021, https://www.nationalfisherman.com/alaska/pebble-mine-owners-discuss-delay-in-appeals-process

126 Bloomberg, Why Palladium is Suddenly the Most Precious Metal, October 28, 2019, https://www.bloomberg.com/news/articles/2019-10-28/why-palladium-is-suddenly-a-more-precious-metal-quicktake-k2ap4ryc

127 Mining News, Rhenium—the hot superalloy element, June 22, 2020, https://www.miningnewsnorth.com/page/rhenium-the-hot-superalloy-element/5748.html

128 National Fisherman, Access Denied: Pebble Mine permit does not pass go, November 25, 2020, https://www.nationalfisherman.com/alaska/access-denied-pebble-mine-permit-does-not-pass-go

in the courts, it would reopen a proposed veto of the Pebble mine, which, if finalized, would effectively block its development on state-owned lands.[129] That process, started under the Obama administration, culminated in a proposed veto of the mine in 2015, before Pebble had even filed a permit application with the Army Corps.

President Biden's EPA, citing its authority under the 1972 Clean Water Act, proposed a legal determination that would ban the disposal of mining waste rock in the Bristol Bay watershed. The proposal would create permanent protections for the waters and wildlife of Bristol Bay, about 200 miles southwest of Anchorage.[130] It would prohibit disposing of mine-related waste within 308 square miles around the site of the proposed Pebble Mine project, an area about four times as large as Washington, D.C.

More than 600,000 people commented on the proposal. Many opposed the mine, though some tribes near the site favor the project, as does the State of Alaska. In late November 2022, Casey Sixkiller, the Region 10 EPA Administrator, sent a recommendation to EPA headquarters to veto the proposed mine.[131] In January 2023, the EPA issued a final determination under the Clean Water Act that bans the disposal of mine waste in part of the bay's watershed. Determinations using the 1972 Clean Water Act are rare with only three issued in the past 30 years. The Pebble Limited Partnership is likely to appeal the determination.[132]

ACCESS TO AMBLER MINING DISTRICT

Federal regulators recently suspended a right-of-way for a road in Alaska, previously granted by the Trump administration, which provided the state access to one of the world's largest mineral deposits including zinc and copper.[133] On March 11, 2022, the BLM notified the Alaska Industrial Development and Export Authority that it suspended a previously issued 50-year right-of-way that covers 25 miles of a proposed 211-mile road connecting the Ambler Mining District to Alaska's highway system. President Biden's BLM determined that the effects the proposed Ambler Road might have on subsistence uses were not properly evaluated and that tribes were not adequately consulted prior to issuing the right-of-way, despite a record of seven years of such evaluations and consultations. The State of Alaska deemed access was essential to its economic development promised in its Statehood Act.

BLM requested a remand to have time to supplement the administrative record. U.S. District Court Judge Sharon Gleason granted BLM's motion for voluntary remand without vacatur.[134] Since then, BLM has held public comments, is drafting a supplemental environmental impact statement, and studying preliminary comments to see if it needs to consider alternatives. The federal agency will issue its final decision on the proposed Ambler road project in the fourth quarter of 2023.[135] The Alaska Industrial Development and Export Authority had planned more than $30 million worth of field work in 2022, half funded by the state-backed corporation and the other half by Ambler Metals, a joint venture owned by South32 Limited and Trilogy Metals. The field work would inform a budget for a final investment decision in 2024. In light of the remand, the partners—as well as NANA Regional Corporation, the Northwest Arctic Borough, and the State of Alaska—are reassessing AIDEA's proposed plan and budget.[136]

PROPOSALS TO CHANGE THE GENERAL MINING ACT

Despite the difficulty of getting needed permits, as illustrated by the above mentioned projects, a number of Congressional lawmakers still want to make changes to the century-old General Mining Act of 1872 to make it more costly to mine for these metals in the United States. In the 117th Congress, former House Natural Resources Chairman Raúl Grijalva (D-AZ) and Senator Martin Heinrich (D-NM) introduced legislation,

129 E&E News, EPA revives Pebble mine veto, September 9, 2021, https://www.eenews.net/articles/epa-revives-pebble-mine-veto/
130 New York Times, Biden Administration Settling a Long Feud, Moves to Block a Mine in Alaska, May 25, 2020, https://www.nytimes.com/2022/05/25/climate/pebble-mine-alaska-epa.html
131 Alaska Public, EPA edges closer to banning Pebble Mine in Alaska. A veto is now just one step away. December, 1, 2022, https://alaskapublic.org/2022/12/01/epa-edges-closer-to-banning-pebble-mine-in-alaska-a-veto-is-now-just-one-step-away/
132 New York Times, EPA Blocks Long-Disputed Mine Project in Alaska, January 31, 2023, https://www.nytimes.com/2023/01/31/climate/pebble-mine-epa-decision.html?campaign_id=2&emc=edit_th_20230201&instance_id=84188&nl=todaysheadlines&regi_id=63692790&segment_id=124063&user id=edd9a99552656979b642d62e6445e311
133 Mining News, White House puts up and Ambler roadblock, March 14, 2022, https://www.miningnewsnorth.com/story/2022/03/18/news/white-house-puts-up-an-ambler-roadblock/7297.html
134 Alaska Business, Ambler Access Work Continues Despite Disappointing Ruling, May 26, 2022, https://www.akbizmag.com/industry/mining/ambler-access-work-continues-despite-disappointing-ruling/
135 Alaska Beacon, Bureau of Land Management Schedules Amber Road Decision for Late 2023, November 17, 2022, https://alaskabeacon.com/briefs/bureau-of-land-management-schedules-ambler-road-decision-for-late-2023/
136 Alaska Business, Ambler Access Work Continues Despite Disappointing Ruling, May 26, 2022, https://www.akbizmag.com/industry/mining/ambler-access-work-continues-despite-disappointing-ruling/

both titled the "Clean Energy Minerals Reform Act," that would fundamentally alter how U.S. mining companies are able to produce minerals on federal lands.[137]

Representative Grijalva's version would establish a federal leasing system for mining, analogous to the program for oil, gas, and coal companies that want to produce energy on public lands. Grijalva's bill would establish a 12.5 percent royalty rate on new mining operations and an 8 percent royalty rate on existing mines. Currently, these mines operating on federal lands do not pay royalties to the government for locatable minerals,[138] and instead pay taxes on income and the employment the mine brings. The bill would also set "strong environmental standards" under the mining law "for mining activities and long-term reclamation" of closed or abandoned mines and require the government to consult with Indigenous tribes prior to "permitting mining activities that will impact tribal communities."

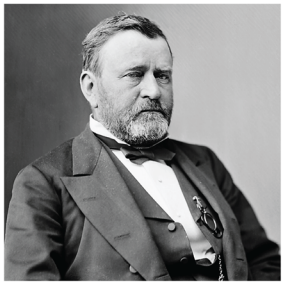
Senator Heinrich's version would require mining companies to pay a rate "not less than 5 percent and not greater than 8 percent based on the gross income" of mining production on federal land.[139] Gross income would not allow for the deduction of expenses related to mining and would seriously affect the competitiveness of U.S. mines on federal lands. The rate, however, "would not apply to mining operations already in commercial production or those with an approved plan of operations." Senator Heinrich's bill would also require "annual rent payments" for mineral claims on federal lands. The Heinrich proposal bill was co-sponsored by 6 other Democratic senators.

These two proposed bills would make it harder to mine or process these metals in the United States, which will only make energy more expensive for Americans. More likely, it will stop most mines dead in their tracks.

THE GENERAL MINING LAW OF 1872

The principal law affecting most hard rock mining on federal lands in the U.S. is the Mining Law of 1872 (Mining Law). It was passed the same year as the establishment of Yellowstone National Park, America's first national park. Both were signed into law by President Ulysses S. Grant, with the National Park preceding the Mining Law by two months. Thus, the principles of protecting and preserving public lands for enjoyment as well as for providing for the public interest in economic development and access to valuable minerals were established at the same time.

The Congressional Research Service (CRS) wrote that the primary purposes of the 1872 law were to "promote mineral exploration and development on federal lands in the western United States, offer an opportunity to obtain a clear title to mines already being worked, and help settle the West."[140]



President Ulysses S. Grant, who signed the 1872 Mining Law.

CRS goes on to say, "the 1872 Mining Law was one of the primary forces behind the development of mineral resources in the West, along with the industries and services that supported mineral production."[141] Major hard rock minerals developed in the West include copper, silver, gold, lead, zinc, molybdenum, and uranium. During the 19th century, major mining districts for silver and gold were developed under the Mining Law in Colorado, California, Idaho, and Nevada. Early in the 20th century, there were major developments of porphyry copper in Arizona. Large molybdenum and tungsten deposits in Colorado were also developed. The Mining Law continues to provide the structure for much of the Western mineral development on public domain lands. Western mining, although not as extensive as it once was, is still a major economic activity, and a high percentage of hard rock mining is on public lands."

The Mining Law has changed numerous times over its history.[142] In 1920, the Mineral Leasing Act removed oil, gas, oil shale, phosphates, sodium, and certain other minerals on federal public domain lands from the claim-patent system of the 1872 Mining Law and set up a system of

137 E&E News, Citing 'clean energy', progressives mount mining law overhaul, April 26, 2022, https://www.eenews.net/articles/citing-clean-energy-progressives-mount-mining-law-overhaul/
138 Ibid.
139 Ibid.
140 Congressional Research Service, Mining on Federal Lands: Hardrock Minerals, July 17, 2009, https://crsreports.congress.gov/product/pdf/RL/RL33908
141 Congressional Research Service, Mining on Federal Lands, September 10, 2002, https://www.everycrsreport.com/files/20020910_IB89130f99a9848eaea77d35f12f472a184809b6da6e665.pdf
142 Ibid.

leasing in which the federal government retains ownership of the leased lands. Coal, which previously had its own claim-patent law (the 1873 Coal Act), was also included in the 1920 Leasing Act. After 1955, common variety minerals such as sand, stone, gravel, cinders, and pumice were sold under the Materials Act of 1947, as amended. During the 1960s and 1970s, the Multiple Use Sustained Yield Act, Wilderness Act, National Forest Management Act, NEPA, and Federal Land Policy Management Act generally addressed environmental protection, multiple use, and management of federal land. By imposing new requirements on agency actions, and by withdrawing some federal lands from development, these acts have affected mineral development under both the leasing system and the Mining Law claim-patent system. The Mining Law contains no direct environmental controls, but mining claims are subject to all environmental laws as a precondition for development.

Between 1872 and 2000, only about 1.5 percent of total public lands transferred out of federal ownership had been patented for mining. About 3.3 million acres had transferred as a consequence of miners proving their claims and paying transfer fees to the treasury to develop mines. The other 98.5 percent were transferred under homestead entries, statehood grants, railroad grants, and other non-mineral public land laws.

THE REPEAL OF THE MINING LAW

Critics of the Mining Law have attempted to repeal it for decades, alleging that it should be changed to a leasing system akin to energy and that title to all lands should remain under the control of the federal government. This comes at a peculiar time, since adding new costs and regulations to mining would simply make mining more difficult in the U.S. at a time when demand for minerals is skyrocketing in response to the transition pursued by European and U.S. governments. As discussed, "green transition" technologies require multiples more mineral products than their carbon-based energy counterpart systems.

The Biden administration has pledged support for this repeal, despite their acknowledgement that there must be more investment in mining and minerals processing in the U.S. to provide the critical minerals necessary for their net zero ambitions. They are rebranding the repeal of the Mining Law as the "Clean Energy Minerals Reform Act," to make it appear to make it easier to develop minerals in America when the legislation would actually make it harder to mine.[143]

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In response, Congressman Pete Stauber (R-MN), Chairman of the House Energy and Minerals Subcommittee, offered an alternative name for the legislation: *"...the UNclean Energy Minerals from China, Russia, and Child Slaves in the Congo Act?"* [144]

The U.S.—where the Mining Law's critics argue the law makes it too easy to mine—is woefully inadequate in mining and mineral processing even to meet today's needs, never mind the mineral needs of an energy transition requiring mountains of new minerals produced and processed at factors of larger quantities. The irony, of course, is that many of the same groups and elected representatives who want to repeal the Mining Law are also supportive of the shift away from hydrocarbons and towards a minerals and critical materials energy system. At that same time, the U.S. is nearly 4 times as dependent upon China for many of these essential minerals as we were ever dependent upon the Middle East for oil.

143 Representative Pete Stauber, Remarks from Energy and Mineral Resources Subcommittee Ranking Member Pete Stauber on Today's Mining Hearing, May 12, 2022, https://stauberforms.house.gov/news/email/show.aspx?ID=ZEXZATUKTUXDO

144 Ibid.

AVERAGE LEAD TIMES FOR PROJECT DEVELOPMENT

Regulatory delays are one of the biggest barriers to new mining development in the United States. They raise costs, extend timelines, and threaten investor confidence. Because of this, the U.S. struggles to compete globally in the minerals marketplace, especially in comparison to countries like China which recognizes the strategic geopolitical advantage of dominating the market share of these critical materials and is developing these capacities at a rapid pace.

It takes 7 to 10 years for a mining project to gain the necessary permits to begin operations in the United States.[145] Even for countries with similar environmental standards to those of the United States, such as Australia and Canada, it takes only two years. What causes this massive difference in approval times? The answer is largely a regulatory one.

The United States legal system contains many jurisdictional layers, meaning that in many cases, there are federal, state, and local governments all in some way regulating the development of new resources. Federal law has preemption and supersedes state and local law and regulation when they are in conflict. When they aren't in conflict, this creates a multi-layered system of interlocking regulations that are incredibly difficult for developers to navigate. This is made even more difficult by complex codes set out by the various executive agencies that have authority to codify regulations on mining, most notable among them the Bureau of Land Management.[146]

Legislative attempts to simplify the regulatory process and ensure that developers can operate with reasonable certainty regarding when their applications will be reviewed and responded to have been made, but to little avail.

There are many federal laws in place that affect mining development. Chief among these is the National Environmental Policy Act (NEPA), discussed in the next section, and the General Mining Law of 1872, examined earlier in this paper. But those two laws are just the beginning of the many laws and regulations that developers must comply with. These are just a few examples:

It takes 7 to 10 years for a mining project to gain the necessary permits to begin operations in the United States. Even for countries with similar environmental standards to those of the United States, such as Australia and Canada, it takes only two years. What causes this massive difference in approval times? The answer is largely a regulatory one.

NATIONAL ENVIRONMENTAL POLICY ACT

At first blush, it might seem like there is nothing objectionable to NEPA. After all, NEPA requires federal agencies to study the environmental impacts of their actions and does not necessarily require any changes to projects. The original purpose was to provide decision makers with adequate information to ultimately make a decision. But in practice, NEPA is now used to slow down projects that have a federal nexus and increase the costs of financing to an unsustainable level.

To understand how NEPA can be used to stop projects, consider the example of the Keystone XL pipeline:

- In July 2008, TransCanada announced its intention to build the Keystone XL pipeline from Canada to the United States.

145 Standards, Best Practices, & Guidance for Mineral Resources & Mineral Reserves, Comparison of reporting environments, August 2008, https://nma.org/wp-content/uploads/2021/05/Infographic_SNL_minerals_permitting_5.7_updated.pdf

146 ICLG, Mining and Regulations Law USA, 2022, https://iclg.com/practice-areas/mining-laws-and-regulations/usa

- In September 2008, because it crossed the U.S.-Canada border, they filed for a cross-border permit with the U.S. State Department.[147]
- In January 2009, the U.S. State Department held the first of 20 scoping meetings for the Environmental Impact Statement for the pipeline.[148]
- In April 2010, the U.S. State Department released a Draft Environmental Impact Statement (EIS) finding that Keystone XL would have "limited environmental impacts" and started accepting comments on the Draft EIS.
- In April 2011, the U.S. State Department released a supplemental Draft EIS.

The end of a pipeline with nobody working on it.

- August 2011, the U.S. State Department releases a final EIS and starts its National Interest Determination.[149]
- September 2011, the final EIS finds no major environmental risks
- November 2011, President Obama delays approval until after the 2012 election
- December 2011, Congress grows frustrated with delays in approving the Keystone XL pipeline and requires President Obama to make a decision within 60 days.
- January 2012, after over 3 years of study by the U.S. State Department, but compelled by law to issue a decision, President Obama denies the cross border permit citing inadequate time to complete environmental examination.[150]
- In 2012, Nebraska holds a hearing on a new route for Keystone XL through Nebraska.
- In September 2012, TransCanada submits a new Keystone XL route through Nebraska for the U.S. State Department to study.
- January 2013, Nebraska's governor approves a new route for Keystone XL through Nebraska.
- March 2013, the U.S. State Department releases a Draft Supplemental EIS finding the project again will not have a significant environmental impact.
- January 2014, the U.S. State Department released the Final Supplemental EIS, again finding that Keystone XL would have negligible effects on the environment.[151]
- November 2015, President Obama rejects TransCanada's application to build the Keystone XL pipeline stating he did not think it was in the national interest.[152]
- January 2017, President Trump signs an executive order to permit the Keystone XL pipeline.
- January 2021, President Biden revokes the Keystone XL presidential permit.
- In June 2021, TransCanada, now renamed TC Energy, terminates Keystone XL.

A few notes about this timeline:

It took the U.S. State Department three years (from 2008 until 2011) to find that Keystone XL posed no significant environmental risks. In 2008

147 U.S. State Department, Record of Decision and National Interest Determination [HTML], https://2012-keystonepipeline-xl.state.gov/nid/249254.htm#8
148 U.S. Chamber of Commerce, Keystone XL: A Long Road to Approval, https://www.uschamber.com/assets/archived/images/00_energy_keystone_osfc_800px.jpg
149 U.S. State Department, Record of Decision and National Interest Determination [HTML], https://2012-keystonepipeline-xl.state.gov/nid/249254.htm
150 Suzanne Goldberg, Keystone XL pipeline: Obama rejects controversial project, Jan. 18, 2012, https://www.theguardian.com/environment/2012/jan/18/obama-administration-rejects-keystone-xl-pipeline?newsfeed=true
151 Institute for Energy Research, Keystone XL: State Department's Latest Report Is Favorable, Feb. 4, 2014, https://www.instituteforenergyresearch.org/fossil-fuels/gas-and-oil/keystone-xl-state-departments-latest-report-is-favorable/
152 U.S. State Department, Keystone XL Pipeline Application, https://2012-keystonepipeline-xl.state.gov/index.htm

there were 170,000 miles of oil pipelines in the United States.[153] The risks were well known. And yet it took three years to study the environmental impacts of a state-of-the-art pipeline.

TransCanada submitted a new route for the Keystone XL pipeline through Nebraska in September 2012, and it took another 16 months to go through the NEPA process and find that—yet again—the pipeline posed negligible environmental impacts.

In 2013, President Obama stated that he won't approve the Keystone XL pipeline if it will "significantly exacerbate the problem of carbon pollution."[154] Despite the fact that the U.S. Statement Department's NEPA work concluded that Keystone XL would have a negligible impact on carbon emissions (because moving oil by pipelines is more energy and carbon dioxide-emissions efficient than moving oil by train or truck),[155] President Obama rejected the pipeline anyway on climate grounds.

The Obama administration used the NEPA process to delay making a decision on Keystone XL for more than four years. The president stated he would make the decision on climate grounds, but when the NEPA studies found insignificant climate impacts, he denied it anyway. President Trump tried to revive the project, but President Biden killed it for good.

With Keystone XL, the Obama administration abused the NEPA process to drive up the costs of building the pipeline by stalling for years and years. The environmental impacts were negligible from the start because there are already so many oil pipelines in the U.S., and pipelines are proven energy transport systems with the least possible impacts.

NEPA is manipulated in a similar manner to slow down mining or stop mining projects. The point of campaigns against economic investments is to lengthen the process for so long that the financial backers of the projects walk away. It has worked remarkably well in the United States as a device to stop economic development.

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CLEAN AIR ACT

Mining activities are also regulated under Title 30 of the Clean Air Act (CAA).[156] The Clean Air Act establishes the guidelines that each type of mineral processing must comply with, there are four broad categories, with the National Emission Standards for Hazardous Air Pollutants being the most stringent. These standards apply to hazardous materials and processes that involve heavy chemicals.

RESOURCE CONSERVATION AND RECOVERY ACT

The Resource Conservation and Recovery Act (RCRA) gives the EPA the authority to control hazardous wastes. An amendment to the law gives it the authority to control non-hazardous wastes. The EPA regulates the generation, transportation, storage, treatment, and disposal of these various wastes.[157]

153 Pipeline and Hazardous Materials Safety Administration, Annual Report Mileage for Hazardous Liquid or Carbon Dioxide Systems, https://www.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-hazardous-liquid-or-carbon-dioxide-systems

154 Institute for Energy Research, It's Time for President Obama to Approve Keystone XL, July 30, 2015, https://www.instituteforenergyresearch.org/fossil-fuels/gas-and-oil/keystone-xl-it-is-time-for-president-obama-to-approve-it/.

155 Drew Johnson, Criticism of Keystone pipeline proving baseless, embarrassing, The Washington Times, June 9, 2015, https://www.washingtontimes.com/news/2015/jun/9/drew-johnson-criticism-of-keystone-pipeline-provin/

156 Office of the Law Revision Council, United States Code Title 30 https://uscode.house.gov/browse/prelim@title30&edition=prelim

157 United States Environmental Protection Agency, Summary of the Resource Conservation and Recovery Act 42 U.S.C. §6901 et seq. (1976), September 28, 2021, https://www.epa.gov/laws-regulations/summary-resource-conservation-and-recovery-act

CLEAN WATER ACT

Under Section 402 of the Clean Water Act (CWA), mines are required to attain a National Pollution Discharge Elimination System permit in order to discharge wastewaters of any kind. This first requires a NEPA Environmental Impact Statement. This is another example of the interconnected nature of the various regulations that apply to mining activities. Additionally, to fill or dredge any waters or wetlands, mining projects must receive a permit under section 404 of the Clean Water Act.[158]

TOXIC SUBSTANCES CONTROL ACT

The Toxic Substances Control Act (TSCA) regulated the "development and application of new and existing chemical substances." Many of the chemicals and materials used in the processing of ores fall under TSCA regulation.[159]

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT

Under Section 108 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), passed in 1980, financial responsibility requirements for the risks posed by various sites are established. Establishing these CERCLA or "Superfund" sites, "gives EPA the authority to require that classes of facilities establish and maintain evidence of financial responsibility to cover the costs associated with releases or threatened releases of hazardous substances from their facilities."[160] CERCLA defines hazardous substances broadly, and this includes the wastes of many mining, milling and smelter byproducts and wastes other regulations like the RCRA may not cover. Under this law, "Regulators have the authority to use special funds, undertake emergency responses, and hold all historical owners or contributors—principal responsible parties—liable for cleanup costs. The definitions of liability are very broad and controversial under CERCLA and provide regulators tremendous enforcement powers."[161]

FEDERAL LAND POLICY AND MANAGEMENT ACT

The Federal Land Policy and Management Act (FPLMA) relates to land-use on federal lands and controls the way that the BLM and the Forest Service administer mining on public lands. According to the EPA:

"Under FLPMA, BLM and USFS land use decisions are subject to NEPA. Federal land managers generally require Plans of Operation, which include reclamation plans and describe details of the proposed operation. By describing these plans in a NEPA document, other federal and state regulatory agencies can comment on aspects of the project design that relate to their respective statutory authorities, regulatory requirements, or that pertain to their particular expertise."[162]

Given the incredible volume of interconnected regulations and agencies, even under a development-friendly administration, it would be expensive and time-consuming to get a mining project approved. Under an anti-development administration, the difficulty is only heightened. None of this is meant to imply that we shouldn't operate mines in the safest and least impactful manner possible. It is meant to show the various ways that these rules and regulations have been

Given the incredible volume of interconnected regulations and agencies, even under a development-friendly administration, it would be expensive and time-consuming to get a mining project approved. Under an anti-development administration, the difficulty is only heightened.

158 United States Environmental Protection Agency, EPA's Hardrock Mining Framework, September 1997, https://www3.epa.gov/npdes/pubs/appc.pdf
159 American Geosciences, What are environmental regulations on mining activities, https://www.americangeosciences.org/critical-issues/faq/what-are-regulations-mining-activities#:~:text=The%20TSCA%2C%20passed%20in%201977,ores%2C%20are%20regulated%20under%20TSCA.
160 United States Environmental Protection Agency, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Federal Facilities; https://www.epa.gov/enforcement/comprehensive-environmental-response-compensation-and-liability-act-cercla-and-federal
161 American Geosciences, What are environmental regulations on mining activities, https://www.americangeosciences.org/critical-issues/faq/what-are-regulations-mining-activities#:~:text=The%20TSCA%2C%20passed%20in%201977,ores%2C%20are%20regulated%20under%20TSCA.
162 United States Environmental Protection Agency, EPA's Hardrock Mining Framework, September 1997, https://www3.epa.gov/npdes/pubs/appc.pdf

manipulated to discourage or stop mineral development altogether.

Attempts have been made to reduce the regulatory burden on developers and streamline the development process, but yet, no attempt has been able to successfully reconcile reasonable precautions for environmental protection with the need for a uniform and consistent system of application that allows for system confidence. Developers have no certainty over things like approval timelines, which makes the process unnecessarily more expensive, and excludes companies with fewer resources who could compete with clearer upfront costs from doing so.

Each of these laws, and the body of regulations relating to them, are subject to appeals and legal challenges by outside parties, providing ample opportunity for delay and increasing uncertainty. Given the significant volatility in minerals prices as demonstrated previously in this paper, investors face growing uncertainty if appellants to a mining project succeed in delaying or denying a mine. The U.S. has earned a reputation as a bad place to invest in a new mining project as a consequence of an almost limitless appeals and "lawfare" process., essentially weaponizing the intricacies of the law to block projects that should be approved on the merits.

INTERNATIONAL POLICY COMPARISONS

Beyond expanding domestic capacity, it may also be prudent for the United States to pursue an extension of our critical minerals' capacity beyond China, especially in countries like Australia and Canada. The greater the supply of these minerals that comes from domestic, or more reliable international sources, the less reliant the U.S. becomes to the vacillations that could be incurred from sudden changes in our relationship with China.

Some legislative efforts to utilize the resources of our allies are underhanded, serving to block domestic production more than anything else. In February 2022, the White House released a fact sheet on "Securing a Made in America Supply Chain for Critical Minerals,"[163] which seeks to shore up domestic supply lines for these resources. The reasoning behind this was that "The U.S. is increasingly dependent on foreign sources for many of the processed versions of these minerals. Globally, China controls most of the market for processing and refining for cobalt, lithium, rare earths, and other critical minerals." But a few months later, the Biden administration pivoted to a minerals policy more concerned with relying on our allies—Canada, Australia, Brazil, and others—than with building domestic supply.[164]

Why is it that the U.S. has a far less robust mining industry than what is present in both Australia and Canada despite a wealth of mineral resources? The differences are largely because of regulation and investment policy.

Why is it that the U.S. has a far less robust mining industry than what is present in both Australia and Canada despite a wealth of mineral resources? The differences are largely because of regulation and investment policy.

One key difference among these three is in the matter of reporting requirements. When companies are seeking investment in mining projects, there are specific regulations around what information they are required to collect and report. Although all three countries have similar sets of guidance in place, in the U.S. there is an additional and more arduous layer in place on top of this shared one. In Canada, mining projects reporting requirements are regulated under National Instrument 43-101, the Standards of Disclosure for Mineral Projects in the country.[165] In Australia, a similar code, the JORC Code, is used.[166] This code is established by the Joint Ore Reserves Committee, and members include all relevant minerals and financial councils in the country. The U.S. has a code with similar requirements to both of these, the SME Guide for Reporting Exploration Results, Mineral Resources, and Mineral Reserves. But this code isn't what is generally used in the regulation of U.S. reporting standards because the Securities and Exchange Commission does not acknowledge

163 The White House, FACT SHEET: Securing a Made in America Supply Chain for Critical Minerals, February 22, 2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/02/22/fact-sheet-securing-a-made-in-america-supply-chain-for-critical-minerals/

164 Reuters, Exclusive: Biden looks abroad for electric vehicle metals, in blow to U.S. miners, May 25, 2021, https://www.reuters.com/business/energy/biden-looks-abroad-electric-vehicle-metals-blow-us-miners-2021-05-25/

165 Standards, Best Practices & Guidance for Mineral Resources Mineral Reserves, Comparison of reporting environments, August 2008, https://mrmr.cim.org/en/library/magazine-articles/comparison-of-reporting-environments/

166 Ibid.

these standards and uses its own Industry Guide 7 instead.[167] This code is both distinct from the other country's codes and does not recognize the same concepts. Most notably, instead of allowing a pre-feasibility study or other form of assessment of viability as Canada and Australia do, respectively, it requires a full feasibility study, which is a costly action to take prior to being able to access investment capital.

This difference in reporting requirements discourages domestic development. The United States reporting requirements for mining companies result in companies traded here looking worse than their global counterparts. The Toronto Stock Exchange and TSX Venture Exchange offer a different paradigm for this and is resultantly the exchange where 47 percent of the world's public mining companies are listed. [168]

The U.S. and Canada are great examples of different mineral policies at play because of proximity and geological similarity, the key difference tends to be one of policy rather than of physical conditions. After China, Canada is the country that the United States is the most reliant on for critical mineral resources.[169]

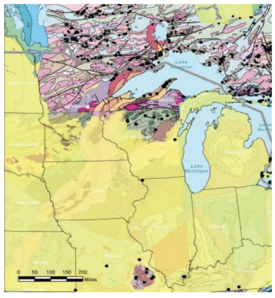
It's helpful to look at a visual of the difference in mineral activities between the two countries. For example, this map showcases the huge disparity in the number of mines in Ontario, Canada, and directly over the border in the United States.[170]

Mines in Ontario vs. USA

No geological reason why mineral endowment stops at the U.S.- Canadian border

Sedimentary rocks covering Precambrian basement

● Sedimentary rocks covering Precambrian basement



Source: Groundbreaking! America's New Quest for Mineral Independence

167 Ibid.
168 Toronto Stock Exchange, 2022 Guide to Listing, 2022, https://www.tsx.com/ebooks/en/2022-guide-to-listing/28/
169 United States Geological Survey, Risk and Reliance: The U.S. Economy and Mineral Resources, April 12, 2017, https://www.usgs.gov/news/featured-story/risk-and-reliance-us-economy-and-mineral-resources
170 Ann Bridges, Addendum to List of Figures in Groundbreaking! America's New Quest for Mineral Independence, https://authorannbridges.files.wordpress.com/2018/11/website-references-to-figures.pdf

CONCLUSION

There is a growing recognition that mining is critical for many evolving energy technologies, especially for electric vehicles, batteries, and renewable energy technologies. The International Energy Agency estimates that we would need 42 times as much lithium, 25 times as much graphite, 21 times as much cobalt, 19 times as much nickel, and 7 times as much rare earths as in 2020 in order to meet the policy goals of the Biden administration and our European counterparts.[171]

While there is a great need for these minerals, the United States is import-dependent on many of them. The USGS recently estimated that there were 50 minerals critical to the security of the United States. In 2021, imports made up more than half of the U.S. consumption for 47 of these mineral commodities, and the United States was 100 percent net import reliant for 17 of them.

While it may appear that the United States will have to import more minerals over time, America's incredible increase in oil and gas production over the last 15 years shows us what is possible if entrepreneurs were granted similar access to the mineral resources along with a regulatory environment that protects the environment and is amenable to experimentation at the same time. America's shale oil and gas deposits were well known to geologists for well over a century. The problem was making the oil and gas flow efficiently and economically. With the advent of horizontal drilling and hydraulic fracturing technologies, along with the right market conditions, America's oil and natural gas producers literally changed the world.

Around 2008, many people argued that we should "drill, baby, drill" domestically to lower oil and gasoline prices. Some experts disagreed that the U.S. could dramatically increase production through drilling. They were wrong. There is no reason why we couldn't repeat this successful policy by streamlining regulations to allow more domestic mining and mining experimentation so the U.S. can experience a mining revolution like we saw with oil production

In 2008, U.S. oil production averaged 5 million barrels a day, but by 2019, the U.S. oil production averaged 12.3 million barrels a day.[172] This is an astonishing 146 percent increase in oil production in only 11 years. This production growth was the result of technological improvements like hydraulic fracturing, better subsurface imaging, and improved directional drilling. But technological advancements were not enough. The revolution that made this dramatic growth possible happened almost exclusively on state and private lands, which allowed for the necessary experimentation without sacrificing the environment.

Around 2008, many people argued that we should "drill, baby, drill" domestically to lower oil and gasoline prices. Some experts disagreed that the U.S. could dramatically increase production through drilling. They were wrong.

There is no reason why we couldn't repeat this successful policy by streamlining regulations to allow more domestic mining and mining experimentation so the U.S. can experience a mining revolution like we saw with oil production. If we continue to hold ourselves back with excessive red tape, then we are deciding as a country that we should import more minerals and especially processed minerals. China currently dominates mineral processing, but there is no reason why the United States can't assume a leadership role in mining as well as mineral processing. A failure to do so will consign the U.S. to a future of economic and national security weaknesses Americans have never known.

171 International Energy Agency, The Role of Critical Minerals in Clean Energy Transitions, May 2021, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

172 Energy Information Administration, U.S. Field Production of Crude Oil, https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mcrfpus2&f=a

Testimony for the Record

U.S. Senate Committee on Energy and Natural Resources

"Hearing to Examine Federal Electric Vehicle Incentives Including the Federal Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains"

January 11, 2024

Table of Contents

Introduction 2
Ever-increasing Demand for EV Minerals 3
Insufficient and Uncoordinated Domestic Minerals Policy 5
Regressive Federal Mineral Policies 7
Interagency Working Group on Mining Regulations, Laws and Permitting 7
Restricting Access to Minerals on Federal Lands 7
Lack of Permitting for Domestic Mining 8
Federal Mineral Production Incentives are Necessary but Lacking 9
Infrastructure Investment and Jobs Act Implementation 10
Inflation Reduction Act Implementation 11
Treasury Proposed Guidance Sabotages Domestic Mineral Supply Chain Security 11
Conclusion 13

America's mining industry supplies the essential materials necessary for every sector of our economy – from technology and healthcare to energy, transportation, infrastructure and national security. The National Mining Association (NMA) is the only national trade organization that serves as the voice of the U.S. mining industry and the hundreds of thousands of American workers it employs before Congress, the federal agencies, the judiciary and the media, advocating for public policies that will help America fully and responsibly utilize its vast natural resources.

We work to ensure America has secure and reliable supply chains, abundant and affordable energy, and the American-sourced materials necessary for U.S. manufacturing, national and economic security, all delivered under world-leading environmental, safety and labor standards. The NMA has a membership of more than 280 companies and organizations involved in every aspect of mining, from producers and equipment manufacturers to service providers. The NMA appreciates the opportunity to offer testimony on behalf of the mineral and hardrock mining industry.

Introduction

Despite being home to vast mineral resource reserves, the United States is facing an existential mineral supply chain challenge. Our import reliance has been a well-documented and increasingly problematic issue for decades and has now become a crisis, exacerbated by pandemic and war-related supply chain challenges, and exponentially increasing mineral demand due to the electrification of our economy.

There is recognition by some within the Biden-Harris administration of the immense challenge we now face and the importance of mined materials to nearly every piece of the President's agenda, especially for reducing our contributions to climate change and reducing its effects. Several of the administration's early actions, including its comprehensive supply chain review, made clear the inherent vulnerabilities of our overreliance on mineral imports, the need for domestic mining support and lack of domestic processing capabilities. The administration also worked to jumpstart the availability of mined materials by using the Defense Production Act to support domestic strategic mineral and material production and processing and tasking the Department of Energy (DOE) with advancing the adoption of green energy technologies.

Congress has reacted with speed and has offered once-in-a-generation incentives, programs and safeguards to secure our mineral supply chains, with domestic sources for these minerals being prioritized. The Infrastructure Investment and Jobs Act (IIJA), the Inflation Reduction Act (IRA), the National Defense Authorization Act, the CHIPS and Science Act, and other bills have signaled to industry and investors that the United States is primed for a modern industrial revolution. Unfortunately, we're

seeing many of those incentives failing to reach back to the mine, or applied unevenly to leave room for taxpayer dollars to go overseas instead of to domestic industries, as intended.

Every tool available will be needed to meet the speed and the scale of the demand now upon us. The domestic mining industry – and our ready and capable workforce – must be at the center of this holistic effort. Solutions to meet anticipated mineral demand while simultaneously rebuilding our domestic supply chains must be comprehensive and should start with increased domestic mineral production and processing, while including strategic alliances with allied nations, increased recycling, and the reprocessing of mine waste.

Ever-increasing Demand for EV Minerals

The most mineral intensive moment in human history is upon us and the U.S. is woefully unprepared. Looking solely at demand coming from the electric vehicle (EV) market: the Energy Transitions Commission estimates up to 250 new mines may be required by 2030.[1] Benchmark Minerals says we will need 384 new mines by 2035. [2] And last month, the Fraser Institute said 388 new mines must be built by 2030.[3] Similarly, a 2022 S&P Global report on copper demand also stated that, "substitution and recycling will not be enough to meet the demands of electric vehicles, power infrastructure, and renewable generation. Unless massive new supply comes online in a timely way, the goal of Net-Zero Emissions by 2050 will be short-circuited and remain out of reach." [4]

It's clearly not a question of if we must mine, but where? The "where" matters as producing minerals here at home, as opposed to countries such as Congo and Zambia – options being pursued by the administration - ensures mining will be conducted in accordance with the world's most stringent environmental, labor and safety regulations, while simultaneously creating high-paying American jobs.

China is the primary producer and/or supplier of mineral commodities listed as essential to U.S. economic and national security as well as for the supply chain for EVs.[5] It controls 80-90 percent of global rare earth element (REE) production, nearly 90 percent of global mineral processing capabilities, as well as the market

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[1] Energy Transitions Commission, "Material and Resource Requirements for the Energy Transition," July 2023; https://www.energy-transitions.org/wp-content/uploads/2023/07/ETC-Material-and-Resource-Requirements-ExecSummary_vF.pdf

[2] https://source.benchmarkminerals.com/article/more-than-300-new-mines-required-to-meet-battery-demand-by-2035.

[3] Fraser Institute, "Failure to Charge: A Critical Look at Canada's EV Policy," Nov. 2023; https://www.fraserinstitute.org/sites/default/files/can-metal-mining-match-the-speed-of-planned-electric-vehicle-transition.pdf.

[4] https://www.spglobal.com/marketintelligence/en/mi/info/0722/futureofcopper.html

[5] Notably this reliance comes despite existing U.S. resources. In the 2022 Mineral Commodity Summaries, the USGS indicated the U.S. had an estimated 48 million metric tons (mt) of copper that can be mined and processed economically, 69 million mt of cobalt, 340 million mt of nickel and 750 million mt of lithium. Regardless, in 2021, the U.S. imported 48 percent of U.S. consumption of nickel, 76 percent of cobalt, 45 percent of copper, and more than 25 percent of lithium.

prices for rare earth elements at each step of the process. China refines 68 percent of the world's cobalt, 65 percent of nickel and 60 percent of battery grade lithium needed for electric vehicle batteries and energy technologies. Goldman Sachs Research also estimates the extent of the vertically integrated nature of China's dominance, with 65 percent of battery components, 71 percent of battery cells and 57 percent of the world's EVs being made in China.[6] Despite our outsized reliance on China for minerals essential for EVs, more than half of all mines in China have no documented information available regarding its impact on the communities they operate near or the environmental impacts on the surrounding area.[7]

The Biden administration has prioritized scaling back U.S. reliance on Chinese minerals. In April 2023, President Biden's national security adviser, Jake Sullivan, warned that "clean-energy supply chains are at risk of being weaponized in the same way as oil in the 1970s, or natural gas in Europe in 2022."[8] In his remarks, he specifically mentioned concerns about minerals that form "the backbone of the clean-energy future."[9] His concerns were prescient. In July 2023, China announced restrictions on the export of gallium and germanium, minerals integral to semiconductors, solar panels and missile systems. The U.S. is currently 100 percent reliant on China for these critical commodities. As accurately described by *The Wall Street Journal*, the action was "more than a trade salvo. It was a reminder of China's dominant hold over the world's mineral resources—and a warning of its willingness to use them in its escalating rivalry with the U.S."[10] The July restrictions were followed by an October 2023 announcement by China setting export restrictions on graphite, a move Geoffrey Pyatt, Assistant Secretary of State for Energy Resources, called a "wake-up call that reflects both the dangers and urgency the U.S. faces in ramping up critical mineral supply chains to meet its climate goals."[11] Then in December 2023, China went further and banned the export of technology to make rare earth magnets essential for EVs, wind turbines and other renewable energy technologies.[12] This adds to China's existing ban on technology to extract and separate certain minerals for EVs.

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[6] Goldman Sachs, "Resource realism: The geopolitics of critical mineral supply chains," Sept. 2023. https://www.goldmansachs.com/intelligence/pages/resource-realism-the-geopolitics-of-critical-mineral-supply-chains.html

[7] Nature.com, "Impacts for half of the world's mining areas are undocumented," Jan. 3, 2024. https://www.nature.com/articles/d41586-023-04090-3

[8] Remarks by National Security Advisor Jake Sullivan on Renewing American Economic Leadership at the Brookings Institution, April 27, 2023. Available at https://www.whitehouse.gov/briefing-room/speeches-remarks/2023/04/27/remarks-by-national-security-advisor-jake-sullivan-on-renewing-american-economic-leadership-at-the-brookings-institution/.

[9] Id.

[10] Jon Emont, Wall Street Journal, China Controls Minerals That Run the World—and It Just Fired a Warning Shot at U.S., July 11, 2023. Available at https://www.wsj.com/articles/china-controls-minerals-that-run-the-worldand-just-fired-a-warning-shot-at-u-s-5961d77b.

[11] E&E Greenwire, "State Dept. official: China's graphite restriction a 'wake-up call'." November 2, 2023. Available at https://subscriber.politicopro.com/article/eenews/2023/11/02/state-dept-official-chinas-graphite-restriction-a-wake-up-call-00125003.

[12] Reuters, "China bans export of rare earths processing tech over national security," Dec. 22, 2023. https://www.reuters.com/markets/commodities/china-bans-export-rare-earths-processing-technologies-2023-12-21/

China's willingness to employ such tactics for decades, has led to skyrocketing prices for many minerals and has required a drawdown of limited stockpiles that will last two to three months at most.[13] As articulated by a former U.S. Trade Representative for China, China's past retaliation patterns are the best clues for predicting what to expect next, and their most effective passive option would be an export suspension of key inputs that would "inflict direct, reciprocal pain."[14]

As described in the findings by the bipartisan congressionally authorized *U.S.-China Economic and Security Review Commission*, "China has subverted the global trade system and moved further from the spirit and letter of its obligations under its WTO accession protocol. China's subsidies, overcapacity, intellectual property theft, and protectionist nonmarket policies exacerbate distortions to the global economy. These practices have harmed workers, producers, and innovators in the United States and other market-based countries." [15]

It is important to remember that China's strong supply chain position does not result from an inherent advantage in reserves for most materials, but rather from heavy handed non-market activities and government subsidization of mining, processing and manufacturing industries, and excesses capacity. With its much longer planning horizon, China has pursued its "Going Global" strategy since the late 1990s, which continues to deploy significant direct investments across the globe to secure mineral supply chains. [16] [17]

Insufficient and Uncoordinated Domestic Minerals Policy

The administration's electrification and national security objectives cannot be achieved through outsourcing our mineral supply chains to countries like China,

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[13] Reuters, "China gallium, germanium export curbs kick in; wait for permits starts." August 1, 2023. Available at https://www.reuters.com/markets/commodities/chinas-controls-take-effect-wait-gallium-germanium-export-permits-begins-2023-08-01/.

[14] The Hill, "China's retaliation playbook can't meet the US export control challenge," October 20, 2022; https://thehill.com/opinion/international/3697077-chinas-retaliation-playbook-cant-meet-the-us-export-control-challenge/

[15] U.S.-China Economic and Security Review Commission, 2022, Executive Summary; p. 16. https://www.uscc.gov/sites/default/files/2022-11/2022_Executive_Summary.pdf

[16] Humphries, Marc. Congressional Research Service, "China's Mineral Industry and U.S. Access to Strategic and Critical Minerals: Issues for Congress," March 20, 2015. http://fas.org/sgp/crs/row/R43864.pdf).

[17] *See also,* USGS 2020 Investigation of U.S. Foreign Reliance on Critical Minerals (There are instances where the mineral deposit or mining and mineral processing operation of a commodity is partially or completely owned and (or) controlled by foreign companies with strong ties to their governments. For example, Chinese firms have purchased equity stake in lithium deposits and operations in Australia and Chile, niobium operations in Brazil, a rare earth deposit in Greenland, and cobalt operations in the D.R. Congo, Papua New Guinea, and Zambia (S&P Global Market Intelligence, 2020). Investigating China's investment in cobalt assets worldwide, Gulley and others (2019) found that when taking into account Chinese companies' ownership in foreign assets on an equity-share basis, China's share of global cobalt production increases from 2 to 14 percent for cobalt mine materials and from 11 to 33 percent for cobalt intermediate materials (figure 6). Furthermore, if the Chinese companies' equity shares of the production from these assets are assumed to be as secure as its domestic production, then these acquisitions have the effect of reducing China's NIR from 97 percent to an adjusted 68 percent, thereby reducing China's exposure to supply disruptions (Gulley and others, 2019).) p. 8.

Russia and the Democratic Republic of Congo that have far less environmental, safety and labor oversight, or in some cases none at all. We only increase our dependence on these and other sources for our minerals needs when we stand in the way of opportunities to enact meaningful supportive policies, instead choosing policies that limit or completely block responsible domestic mineral development.

In addition, international competition for minerals is accelerating and nearly every other Western ally aside from the U.S. has prioritized enacting coordinated mechanisms and policies to incentivize their domestic mining operations to be able to meet their own skyrocketing demand. As Dr. Daniel Yergin of S & P Global cautioned in 2023 congressional testimony, overzealous attempts to source minerals primarily from allied countries while blocking domestic projects is not a viable solution, as our allies are experiencing similar supply constraints.[18]

In the last two years, Canada released its strategy to position itself as the "global supplier of choice for clean energy minerals;" [19] the United Kingdom released its critical minerals strategy;[20] Australia released its 2023-2030 Critical Minerals Strategy to "maintain and grow our sovereign [minerals] capability;" [21] and the European Union unveiled a comprehensive proposal including various permitting efficiency actions to ensure the EU's access to a secure, diversified, affordable and sustainable supply of critical raw materials. [22]

The U.S. has all the ingredients necessary to counter our excessive import reliance. However, the wrong policies are creating substantial setbacks. The U.S.-China Economic and Security Review Commission found in its 2022 report that:

> *"The current ability of the U.S. to overcome the scale and scope of China's harmful policies is undermined by the lack of a coherent strategy and fragmented authorities to mobilize resources, coupled with a deficiency in new tools to address economic injury. The U.S. is also impeded by its self-imposed barriers to employing and underutilization of available tools and its difficulties in data sharing and analysis."* [23]

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[18] Testimony of Dr. Daniel Yergin, Vice Chairman of S&P Global before the U.S. Senate Committee on Energy and Natural Resources, Hearing on "Critical Minerals," Sept. 28, 2023.
[19] Natural Resources Canada News Release, "Countries Commit to the Sustainable Development and Sourcing of Critical Minerals," Dec. 12, 2022. https://www.canada.ca/en/natural-resources-canada/news/2022/12/countries-commit-to-the-sustainable-development-and-sourcing-of-critical-minerals.html
[20] Department for Business, Energy and Industrial Strategy, "Resilience for the future: The UK's critical minerals strategy, 22 July 2022. https://www.gov.uk/government/publications/uk-critical-mineral-strategy/resilience-for-the-future-the-uks-critical-minerals-strategy
[21] Australian Government, "Critical Minerals Strategy 2023-2030," June 20, 2023. https://www.industry.gov.au/publications/critical-minerals-strategy-2023-2030
[22] European Union's Critical Raw Materials Act, March 16, 2023. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/green-deal-industrial-plan/european-critical-raw-materials-act_en
[23] U.S.-China Economic and Security Review Commission, 2022, Executive Summary; p. 16. https://www.uscc.gov/sites/default/files/2022-11/2022_Executive_Summary.pdf

Regressive Federal Mineral Policies

The right policies to support domestic mineral production and our EV supply chains are more important than ever. Unfortunately, the current administration has in various instances exhibited regressive behaviors toward U.S. minerals policy despite its initial assertion it was prioritizing responsible mineral sources, domestic supply chains and an American workforce.

Though significant efforts by individual federal agencies to secure our supply chains have shown signs of success, including through funding and incentive programs at the Department of Energy, the Department of Defense, the Export-Import Bank and the Department of Commerce, broad actions over the past three years have damaged our prospects of achieving a secure supply of responsibly produced domestic minerals for EVs and renewable energy technologies. Especially problematic examples of these actions include the following.

Interagency Working Group on Mining Regulations, Laws and Permitting

Citing recommendations of the 100-day supply chain reports initiated by EO 14017, the White House Interagency Working Group (IWG) on Mining Regulations, Laws and Permitting was created, with overall direction provided by the Department of the Interior (DOI), to develop recommendations that will inform future rulemaking and administrative actions for all domestic mining projects on federal lands. The IWG in September 2023 released its report totaling 168 pages and containing 65 separate recommendations that seek to upend established precedent for mining on federal lands. While some recommendations are overall supportive of domestic mineral supply chains and should be pursued, the report largely includes problematic recommendations, including four main, flawed and punitive mechanisms that those opposed to any kind of mining have sought to advance to disrupt and discourage investment in mining by making it unprofitable and unworkable. These four mechanisms are: converting the locatable system, which is uniquely suited to hardrock mining, to a leasable system; seeking excessive royalties and other unnecessary financial burdens; imposing prescriptive and duplicative operational standards; and introducing unprecedented authority to deny projects that comply with all laws and regulations.

It should come as no surprise that investors favor projects where they are likely to get the earliest return on their investment and where they know they have the necessary security of title and tenure from the time of location through mine reclamation and closure. As a result, investment dollars for mineral exploration and development tend to flow to countries with a stable political environment, strong economy, an efficient permitting system and predictable regulatory climate.

Restricting Access to Minerals on Federal Lands

Access to federal lands for mineral exploration and development is critical to a strong domestic mining and manufacturing industry. These lands will continue to provide a

large share of the metals and hardrock minerals produced in this country. Currently, half of all public lands are either off-limits or under restrictions for mineral development, rendering unknown amounts of resources on adjacent state and private lands inaccessible because of federal land restrictions.

The Biden administration continues to pursue a myriad of policies, rulemakings, determinations, and designations to limit or restrict access to highly mineralized federal lands. These include: mineral withdrawals in Minnesota and Alaska covering land that contains abundant copper, nickel, cobalt and other EV minerals; monument designations; preemptive permit vetoes; mitigation policies; conservation initiatives such as the Bureau of Land Management's (BLM) proposed Conservation and Landscape Health Rule that would overhaul the way the agency manages federal lands under the Federal Land Policy and Management Act (FLPMA) by making conservation a use on par with other uses of public lands under FLPMA's multiple-use and sustainable-yield framework and allow conservation land leases in perpetuity; and other proposed rules, to name a few.

These actions, at best, are short-sighted policies. At their worst, they are self-sabotage. A *Wall Street Journal* editorial [24] from 2023 may have put it best:

> *"Wouldn't it be better for American workers and the environment to mine these minerals in the U.S.? At least the Administration is consistent on one point: It wants to keep all U.S. natural resources that could be strategic energy assets in the ground."*

While mining is certainly not appropriate on all federal lands, the administration's actions threaten access and should not occur without more informed decisions regarding the mineral potential of the underlying lands. If the U.S. is to supply the essential materials necessary for EVs, we must ensure continued access to our public lands for responsible mineral development.

Lack of Permitting for Domestic Mining

In the last two decades, global investment in U.S. mining has been halved due largely to permitting uncertainty. With so many variables at play within a mining project, the importance of regulatory certainty in attracting investment in mining projects cannot be overstated. Mining is a capital-intensive process that takes years of exploration, engineering, design and development before minerals can be produced. Unlike coal, oil or gas exploration, concentrations of useful minerals that are rich enough to form ore deposits are rare with approximately 1 out of 1,000 deposits having the qualities that allow them the chance of being transformed into an operating mine. Coupled with the complex state and federal permitting process, significant time may pass – the NMA has member companies whose projects have been more than 20 years in the making and billions of dollars invested before

[24] Wall Street Journal, "Biden's Green-Energy Mineral Lockup. The feds block mining that is essential for making EV batteries" January 29, 2023, https://www.wsj.com/articles/biden-administration-mining-duluth-complex-minnesota-superior-national-forest-deb-haaland-electric-vehicles-11674860178.

bringing in a single dollar in return – impacting the ability of mining companies to attract investment capital.

Since taking office, the Biden administration has permitted just two mines requiring an Environmental Impact Statement that would supply minerals essential for EVs. This minimal progress is halved when factoring in a 2021 decision to rescind a final Environmental Impact Statement issued by the U.S. Forest Service for the Resolution Copper project, which would supply over 25 percent of U.S. copper demand each year.

Congress has recognized the administration's inaction and has stepped in to help mitigate permitting delays, including enacting the Infrastructure Investment and Jobs Act (IIJA). IIJA Section 40206 requires the DOI and the USDA to submit a report to Congress implementing already enacted steps to increase the timeliness of permitting activities for the exploration and development of domestic critical minerals. Two years later, the DOI and USDA failed to comply with the law. Despite several oversight requests to DOI for updates on this requirement by members of this committee, it's clear that the administration has "misplaced priorities or perhaps a willingness to ignore certain requirements." [25]

Additional proposals by the administration appear directly intended to block existing opportunities for permitting efficiency. In September 2023, the Federal Permitting Improvement Steering Council (Council) proposed[26] to amend its existing regulations to limit application of the FAST–41 permitting process to projects that involve primary or byproduct production of "critical minerals" as defined by the U.S. Geological Survey. This proposed change is a sudden and shortsighted departure from Council's 2020 vote to add all mining, without bias to the type of mineral, as a covered sector to the list of those eligible for the FPISC permitting process. This recent narrowing of eligible projects is contrary to both the administration's electrification objectives and the will of Congress and hamstrings the already limited activity by the Council, which to date has accepted only one mining project to the program.[27]

Federal Mineral Production Incentives are Necessary but Lacking

Despite the administration's often disjointed and sometimes regressive approach to addressing mineral supply chain security, Congress has enacted key policies that are incentivizing domestic mineral supply chains and signaling greater investment certainty from the private sector in mining and manufacturing. These opportunities

[25] Senate Committee on Energy and Natural Resources, "Manchin Questions Haaland About Interiors Leasing Plans and Failure to Meet Deadlines," May 2023. https://www.energy.senate.gov/2023/5/manchin-questions-haaland-about-interior-s-leasing-plans-and-failure-to-meet-deadlines.

[26] Revising Scope of the Mining Sector of Projects That Are Eligible for Coverage Under Title 41 of the Fixing America's Surface Transportation Act; https://www.govinfo.gov/content/pkg/FR-2023-09-22/pdf/2023-20270.pdf

[27] South32, "Hermosa confirmed as the first FAST-41 mining project," May 2023. https://www.south32.net/news-media/latest-news/hermosa-confirmed-as-the-first-fast-41-mining-project.

were made available by a portion of the $500 million included in the Inflation Reduction Act (IRA) and the roughly $1.2 trillion in incentives within the Infrastructure Investment and Jobs Act (IIJA).

Infrastructure Investment and Jobs Act Implementation

In 2021, the IIJA was signed into law, creating new bipartisan provisions adding critical mineral production, processing, and recycling to the eligible categories for DOE LPO financing and creating new funding incentives and programs for domestic supplies of key minerals and materials for energy technologies, including for coal to REE projects. The DOE has shown consistent leadership by delivering funding opportunities and incentives for minerals processing and refining, recycling, and manufacturing.

The effective implementation of these programs is underway, and the industry is responding and benefiting all the while working to improve the domestic mineral supply chain and operational efficiency of mining in the U.S. The NMA has worked closely with the DOE, the U.S. Department of the Treasury and Congress to support the implementation of these programs to ensure a wide range of opportunities can be utilized by the domestic mining industry, in-turn, providing the greatest return on taxpayer funding.

However, the NMA believes that the DOE must do more to secure upstream energy minerals value chains. DOE's Title 17 Innovative Energy Loan Guarantee Program has more than $400 billion in estimated loan capacity available to provide loan guarantees to accelerate deployment of innovative, all-of-the-above energy projects. This includes more than $3 billion in loan guarantees available to support efficiencies in "mining, extraction, processing, recovery, or recycling of critical materials projects." [28]

IIJA Section 40401(a)(2) amended Section 1703(b) of the Energy Policy Act of 2005 (42 U.S.C. 16513(b)) by adding a thirteenth category of lending eligibility, specifically, "projects that increase the domestically produced supply of critical minerals (as defined in section 7002(a) of the Energy Act of 2020 (30 U.S.C. 1606(a)), including through the production, processing, manufacturing, recycling, or fabrication of mineral alternatives."[29] Despite this congressional mandate, there have been no projects funded by DOE that boost the domestic extraction of minerals.

Further, DOE in May 2023 released an Interim Final Rule that "amends Title 17 regulations to implement changes that expand or modify program authority and to revise for clarity and organization."[30] The interim rule provided another self-imposed

[28] DOE Critical Materials Loans & Loan Guarantees handout, accessed Oct. 17, 2023. https://www.energy.gov/sites/default/files/2021-06/DOE-LPO_Program_Handout_Critical_Materials_June2021_0.pdf
[29] 42 U.S.C. 16513 - Eligible projects. https://www.govinfo.gov/content/pkg/USCODE-2021-title42/pdf/USCODE-2021-title42-chap149-subchapXV-sec16513.pdf
[30] Federal Register, Loan Guarantees for Clean Energy Projects (88 FR 34419). https://www.federalregister.gov/documents/2023/05/30/2023-11104/loan-guarantees-for-clean-energy-projects

barrier to employing underutilized and available tools that support the energy transition.

Inflation Reduction Act Implementation

In 2022, the IRA became law and created new domestic production incentives for critical minerals in electric vehicles and manufacturing tax credit eligibility for critical material processing.

The IRA provides coordinated opportunities to support an all-of-the-above energy policy. If implemented as Congress intended, the IRA would ensure American leadership in mining and manufacturing and support energy and national security.

Primary incentives in the IRA included the 30D EV Tax Credit for vehicles that contain specific amounts of domestic and ally minerals. Unfortunately, the Treasury Department released proposed implementation guidance to take effect in April 2023 that gave the Treasury Secretary wide latitude for determining which countries constitute countries with which the U.S. has a free trade agreement for the purposes of meeting the domestic sourcing requirements and qualifying for the tax credit under the IRA.[31] The Treasury stated that because the term is not defined in statute, eligible countries could include those with newly negotiated one-off critical minerals agreements. The NMA expresses disappointment similarly shared by bipartisan members of Congress who have stated that the credits were intended for domestic industry activities.

Treasury Proposed Guidance Sabotages Domestic Mineral Supply Chain Security

The IRA included a new provision for an existing Section 45X tax incentive that allows a list of 50 "applicable critical minerals" to receive the credit after December 31, 2022, if produced and sold in the U.S. or in a U.S. possession by a taxpayer and sold to an unrelated person. Unlike other types of eligible components in § 45X, applicable critical minerals are not subject to a credit phaseout for sales after 2029. The magnitude of this provision underpins much of the success of all other incentives provided within the IRA.

Unfortunately, proposed guidance (REG-107423-23)[32] issued by the Treasury in December 2023 was written in a manner that will ultimately sabotage the effectiveness of the IRA, the long-term security of the EV mineral supply chain, and the ability for the domestic mining industry to be globally competitive against geopolitical adversaries and non-market actors. Under the proposed regulations the only critical mineral production costs eligible to be counted for purposes of the tax credit are those for chemical conversion and purification (i.e., processing); direct or

[31] U.S. Department of the Treasury, "Treasury Releases Proposed Guidance on New Clean Vehicle Credit to Lower Costs for Consumers, Build U.S. Industrial Base, Strengthen Supply Chains," March 31, 2023. https://home.treasury.gov/news/press-releases/jy1379

[32] Federal Register, "Section 45X Advanced Manufacturing Production Credit," Dec. 15, 2023. https://www.federalregister.gov/documents/2023/12/15/2023-27498/section-45x-advanced-manufacturing-production-credit

indirect material costs or costs related to the extraction or acquisition of raw materials would not count.

This limitation is not required by the underlying statute and is nonsensical since the costs to mine the listed critical minerals are likely to be 50 percent or more of the total cost of producing the mineral in its ultimate purified state. And of course, critical minerals cannot be produced in their purified form without first being extracted from the ground. By limiting the type of production costs eligible to be counted, the proposed regulations would deny the benefits of the § 45X credit to the domestic mining industry and thus frustrate the congressional goal of stimulating new and improved domestic supply chains for critical minerals.

The proposed regulations essentially say that only the processor of the critical minerals is eligible to claim the credit unless the processor is acting as a contract manufacturer and has a written agreement with the other contract parties as to who will claim the credit. This concept would not accommodate situations in which a miner extracts the minerals and then transfers them to another (likely unrelated) party who refines or further refines them. Mining and refining activities are not typically done in partnership between miners and refiners.

To make the § 45X credit work in the real world, it must permit each party in the U.S. supply chain - from extraction through refining - to claim a tax credit on the value-added costs the party incurs for extraction and other raw materials costs, provided the mineral ultimately reaches the requisite purity. The NMA urges the Treasury to expeditiously issue updated guidance that proposes an actionable mechanism that counts value-added costs of extraction, as defined by § 1.30D-3(c)(8)[33] of the proposed guidance, into account.

Further, the § 45X credit for domestic production of critical minerals should not be available with respect to the costs of raw materials extracted in foreign countries or, in the case of recycling, sourced in foreign countries. The § 45X credit is intended to stimulate domestic production of minerals. If the final regulations permit extraction costs to be taken into account, they should count only the costs of extraction that occurred in the U.S. or in a U.S. possession. To do otherwise would support foreign production because U.S. processors would be able to claim the credit on their extraction costs when the raw materials are extracted overseas.

[33] The preamble to the proposed regulations asks for comment on whether "extraction" should be defined consistent with the proposed § 1.30D-3(c)(8). Under that section, "extraction" means the activities performed to extract or harvest minerals or natural resources from the ground or a body of water, including, but not limited to, by operating equipment to extract or harvest minerals or natural resources from mines and wells, or to extract minerals or natural resources from the waste or residue of prior extraction. Extraction concludes when activities are performed to convert raw mined or harvested products or raw well effluent to substances that can be readily transported or stored for direct use in critical mineral processing. Extraction includes the physical processes involved in refining. Extraction does not include the chemical and thermal processes involved in refining.

Conclusion

As the administration has made clear, time is not on our side. China's grip on mineral supply chains is tightening and mineral supply deficits are already weighing on the cost and deployment schedule of critical energy and EV technologies. Although we should secure and grow strong partnerships with like-minded allies such as Canada, Australia, Korea, Japan and others, we must prioritize the vertical integration of our own domestic abilities for mineral supply chains to ensure we are able to support our allies just as they support us, and to limit any future potential shocks to any one supply chain.

Investing in this supply chain and reshoring essential capacity is critical to our own national security, economic competitiveness and climate goals. We need federal policies that truly incentivize responsible domestic resource development – beginning with extraction and supporting the entire value chain of minerals – and provide the regulatory certainty through permitting reform that is necessary to attract adequate private sector investment. Without this action, the U.S. will be watching the global competition for mineral and energy dominance from the sidelines.

This begins with thoughtful implementation of the permitting provisions included in the IIJA, allowing mineral extraction and production projects to be eligible for IRA incentives as Congress intended, following the congressional intent of the NEPA reforms included in the bipartisan Fiscal Responsibility Act, and ensuring access to mineralized federal lands.

These are important first steps to solving our nation's disjointed minerals policy. Much more needs to be done to provide certainty, restore investor confidence, and loosen the grip of geopolitical competitors and economic adversaries. This will ensure our nation's ability to meet the dramatic increases in minerals production that will be needed in the coming decades to keep up with EV demand, energy technologies, infrastructure, manufacturing and more.

The NMA applauds the work of this committee, and pro-domestic mining legislation pursued by Chairman Joe Manchin (D-W. Va.), Ranking Member John Barrasso (R-Wyo.), Sen. Catherine Cortez Masto (D-Nev.), Sen. Jim Risch (R-Idaho) and others. Our priorities remain ensuring regulatory certainty, securing time limits on reviews and judicial review of federal agency actions, getting the decisions made by BLM state offices to the Federal Register for public comment and out of endless review in in a timely manner, allowing responsible access to federal lands, and prioritizing the need to permit domestic mining to preserve U.S. competitiveness. Combined with well-developed federal incentives for mineral extraction and production, these efforts will ease our nation's bureaucratic paralysis and provide for greater economic competitiveness and growth.

The NMA appreciates the opportunity to provide comments to the committee and looks forward to working with Congress and the administration to support a robust

domestic mineral supply chain for EVs, and all other industries, for generations to come.

ZETA | ZERO EMISSION TRANSPORTATION ASSOCIATION

Statement for the Record submitted by the Zero Emission Transportation Association (ZETA)

Senate Committee on Energy and National Resources Hearing to Examine Federal Electric Vehicle Incentives Including the Federal Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains held on January 11, 2024

Submitted: January 24, 2024

Dear Chairman Manchin and Ranking Member Barrasso:

ZETA is an industry coalition of over 60 member companies advocating for 100% electric vehicle (EV) sales. ZETA is committed to enacting policies that drive EV adoption, create hundreds of thousands of jobs, dramatically improve public health, and significantly reduce carbon pollution. Our coalition spans the entire EV supply chain, encompassing critical minerals developers, original equipment manufacturers (OEMs), charging infrastructure installers, utility providers, and battery recyclers, among others. ZETA is dedicated to ensuring that American workers and consumers benefit from growing EV adoption.

ZETA would like to thank the Senate Committee on Energy and Natural Resources for the opportunity to submit a statement to the record for its hearing on federal EV incentives. ZETA and its membership are committed to working with the Biden-Harris Administration and members of this Committee to educate stakeholders and ensure the successful implementation of the Inflation Reduction Act (IRA). The following statement will respond to specific concerns raised by Senators during the hearing on January 11, 2024.

I. Repealing the EV provisions in the IRA would have a significant, negative impact on the U.S. economy.

—"The damage that the IRA will do to America's automotive sector is potentially catastrophic…this is a mistake."

The public and private investments made in the IRA reinvigorated American industry, and EV purchase and production incentives are a cornerstone of this success. Any move to repeal these key provisions of the legislation would have an immediate negative impact on American manufacturing, jobs, and economic competitiveness.

Repealing EV funding in the IRA would jeopardize:

- $177 billion of private investment in the EV supply chain[1]
- ~200,000 estimated direct jobs[2]
- ~800,000 indirect jobs[3]
- 408 new or expanded facilities[4]

Even as this technology is in its early stages, the IRA and Bipartisan Infrastructure Law (BIL) are catalyzing private investment like never before. A recent report from the Environmental Defense Fund and WSP USA found that 80% of the $165 billion in announced EV sector investments over the last eight years, and more than 128,000 new jobs announced, have come since the passage of the BIL in November 2021.[5] The same report projects that recently announced investments are expected to create more than 800,000 additional jobs in the broader economy.

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[1] 'EV Jobs Hub.' BlueGreen Alliance Foundation, (2024) https://evjobs.bgafoundation.org/

[2] 'Opening Statement for the Senate Energy and Natural Resources Committee "Hearing to Examine Federal Electric Vehicle Incentives Including the Government's Role in Fostering Reliable and Resilient Electric Vehicle Supply Chains," U.S. Deputy Secretary of Treasury Adewale Adeyemo, (January 11, 2024) https://www.energy.senate.gov/services/files/AA567D87-DA99-4E39-A97F-C02CA2BE6E93

[3] ibid

[4] 'EV Jobs Hub.' BlueGreen Alliance Foundation, (2024) https://evjobs.bgafoundation.org/

[5] 'One Year After IRA Passage, New Report Finds U.S. Electric Vehicle Investments, Jobs Continue to Soar,' Environmental Defense Fund, (August 16, 2023) https://www.edf.org/media/one-year-after-ira-passage-new-report-finds-us-electric-vehicle-investments-jobs-continue

II. The EV industry is responsible for the growth of well-paid U.S. jobs across the automotive and advanced manufacturing sectors.

—"Ford's CEO says that EVs will require 40% less labor to produce than ICE vehicles. Manufacturing is increasingly being done in non-union facilities co-owned by foreign entities"

—"EV subsidies go primarily to California, where nearly 40% of all EVs in America are sold. We are stuck subsidizing wealthy people in California."

The International Energy Agency (IEA) estimates that 12 new jobs are created for every $1 million invested in charging infrastructure; by comparison, internal combustion engine vehicle (ICEV) manufacturing creates an average of 7.2 jobs per million invested. The IRA and BIL are helping U.S. automakers vertically integrate and onshore their production. This stands in stark contrast to the ICEV sector, which has seen dramatic job loss as a result of the availability of cheaper labor overseas.

As a result of the EV industry's growth, every state can be an "auto state," home to suppliers and manufacturers who produce parts for all vehicle power trains. Over the next five years, the Environmental Defense Fund predicts that 26 states will house new factories or production lines to manufacture EVs, batteries, components, and chargers.[6] Some states' EV economies are growing faster than others: as of November 2023, one-third of the private investment that occurred as a result of the IRA—$48 billion—benefited communities in Georgia, Arizona, Nevada, and Michigan. Those four states, along with Wisconsin, Pennsylvania, and North Carolina, are some of the most competitive in the country.[7]

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[6] 'New climate laws drive boom in electric vehicle jobs.' Environmental Defense Fund, (August 17, 2023) https://vitalsigns.edf.org/story/new-climate-laws-drive-boom-electric-vehicle-jobs

[7] 'In 2024, Republican EV Attacks May Fall Short as Swing States Reap Investment.' U.S. News, (November 27, 2023) https://www.usnews.com/news/top-news/articles/2023-11-27/in-2024-republican-ev-attacks-may-fall-short-as-swing-states-reap-investment

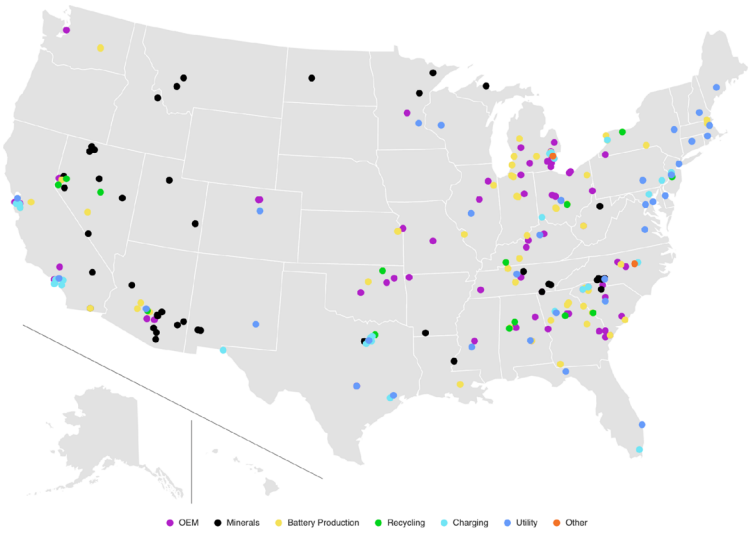

Figure 1: U.S. EV industry investments map

The ZETA Education Fund's EV Investments Map tracks EV sector facilities across the U.S. and is updated regularly. An interactive version of the map that provides details on the jobs at the facility and its private-sector investment amount is at www.zeta2030.org/education-fun/investments.

Similarly, while some argue that EV investment will reduce auto jobs due to decreased maintenance, the Bureau of Labor Statistics predicts little or no change from 2021 to 2031 for automotive service technicians.[8] Likewise, independent reports by both the International Council on Clean Transportation (ICCT) and Carnegie Mellon have found that "estimated total labor requirements for BEV [battery-powered EV] production exceed that of ICEV production, bringing motor, battery module, and battery cell fabrication in-house could lead to higher in-house labor hours to build BEVs than ICEVs."[9]

As the country rapidly shifts to EVs, building a North American EV manufacturing capacity presents a prime opportunity for robust job growth, especially in rural communities. An

[8] 'Automotive Service Technicians and Mechanics : Occupational Outlook Handbook.' U.S. Bureau of Labor Statistics, (September 6, 2024) https://www.bls.gov/ooh/installation-maintenance-and-repair/automotive-service-technicians-and-mechanics.htm#tab-1

[9] 'Two reasons the EV transition could mean more U.S. manufacturing jobs: Vertical integration and onshoring.' International Council on Clean Transportation, (December 21, 2023) https://theicct.org/two-reasons-the-ev-transition-could-mean-more-us-manufacturing-jobs-dec23/

automotive facility situated in a rural area has a jobs multiplier of 2.1[10], which means that every job at the plant will create an additional 1.1 jobs in the larger community.

III. Treasury's implementation of the IRA guidance does NOT allow China to benefit from U.S. federal funding.

—"You're interpreting it [the IRA] now to allow the tax credits to flow to Chinese entities. So now, U.S. tax dollars are literally subsidizing Chinese battery makers."

The IRA represents the greatest counter-offensive the U.S. has made against China's dominance in critical material and clean energy supply chains.

The clean vehicle incentives in the IRA have two key policy objectives: increase EV deployment and counter foreign influence by building domestic clean energy supply chains. Designed to complement each other, the Section 30D New Clean Vehicle Tax Credit and the Section 45X Advanced Manufacturing Production Tax Credit will be the main drivers of these policy outcomes.

Through the proposed Foreign Entities of Concern (FEOC) guidance, the U.S. Departments of Energy (DOE) and Treasury (Treasury) set a strong standard that will fortify our supply chains and ensure the U.S. owns and leads the transition to clean transportation. These standards aim to balance the goal of onshoring mid- and upstream production with bolstering the rapid growth of domestic battery and vehicle manufacturing sectors.

The impact of these standards on the private sector is already clear. When Congress passed the IRA in 2022, 41 vehicle models qualified for the 30D consumer New Clean Vehicle Tax Credit. In the interest of American economic security, Treasury's guidance disqualifies batteries from some of the highest-volume battery manufacturers in the world. As of January 1, 2024—when updated guidance went into effect—only 13 vehicles qualify.[11]

The 45X tax credit provides $35 per kilowatt-hour (kWh) for each battery cell and $10 per kWh for each battery module. It also covers 10% of the costs of production of applicable critical materials, which will significantly drive down the costs of domestic clean energy manufacturing. If implemented thoughtfully, the 45X credit will usher in a new era of American industrial

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[10] 'Contribution of the automotive industry to the economies of all fifty states and the United States,' Center for Automotive Research, (2010), https://www.cargroup.org/wp-content/uploads/2017/02/CONTRIBUTION-OF-THE-AUTOMOTIVE-INDUSTRY-TO-THE-ECONOMIES-OF-ALL-FIFTY-STATES-AND-THE-UNITED-STATES.pdf

[11] 'The list of EVs eligible for a tax credit just got a lot shorter. Here's the 13 left,' Business Insider, (January 1, 2023) https://www.businessinsider.com/list-evs-electric-cars-qualify-for-federal-tax-credit-2024-1#chevrolet-bolt-ev-1

expansion over the next decade that facilitates the widespread deployment of domestically produced, affordable, clean energy technologies—particularly EVs.

The decrease in the number of qualifying vehicles is evidence that the investments made through the IRA are not going to Chinese-owned entities or other FEOCs. By combining 30D with the 45X manufacturing tax credit, the U.S. has jump-started a North American manufacturing boom that will supplement ongoing efforts to restructure international supply chains and place the U.S. in a leadership position.

IV. The final 45X proposed guidance must include direct and indirect material costs and costs related to the extraction of raw materials.

In December 2023, Treasury and the Internal Revenue Service (IRS) proposed guidance to implement the Section 45X credit.[12] However, **the proposed guidance excludes direct and indirect material costs and costs related to the extraction of raw materials**.[13] This proposed exclusion was intended to "mitigate the risk of crediting the same cost multiple times" and to ensure that the credit is provided for production activities that add value to the applicable critical mineral. In practice, however, the exclusion could curtail and constrain the intended benefits of the Section 30D credit.

As proposed, the recent 45X credit guidance will help achieve neither and, in fact, could serve as a hindrance to the success of both provisions. Without a robust, secure supply of critical minerals and battery components, increasingly stringent sourcing requirements tied to 30D eligibility could make fewer vehicles eligible. The decision to restrict access to the 45X credit for direct and indirect materials costs will curtail future domestic supply, worsening a pre-existing bottleneck[14] rather than alleviating it.

This will have the practical effect of capping the 30D credit's ability to increase EV deployment and build a domestic critical mineral, battery component, and battery recycling supply chain. Failing to count direct and indirect material costs and costs related to the extraction of raw materials as eligible to receive the 45X credit in tandem with the IRA's 30D eligibility criteria could, in effect, phase the 30D credit out faster than the IRA's statutory expiration in 2032.

V. EVs will not negatively impact the electrical grid.

—"Is our current grid infrastructure capable of supporting a massive increase in EV usage?"

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[12] *See* 88 FR 86844 (Dec. 15, 2023)
[13] As defined in proposed § 1.263A–1(e)(2)(i)(A) and § 1.263A–1(e)(3)(ii)(E) respectively.
[14] 'Critical Mineral Permitting Reform Framework,' Zero Emission Transportation Association, (2022) https://www.zeta2030.org/insights/critical-mineral-permitting-reform-framework

While it is true that transitioning from ICEVs to EVs will increase American drivers' electricity consumption and change distribution strategies for electricity providers, this change will not happen overnight—and the increased demand will be incremental.

The American power sector is aware of the ongoing transition to an electrified transportation sector and is proactively preparing for it. In 2023, ZETA published a policy brief titled "Powering the EV Market: How Electricity Providers are Planning for the Future."[15] The brief highlights case studies from major electricity providers (e.g. PG&E, Duke Energy, Salt River Project, and Xcel Energy) who power the homes of 57.2 million U.S. customers.

Today, EVs account for a small fraction of U.S. electricity consumption. In 2021, the U.S. fleet of EVs used 6.1 terawatt-hours (TWhs) of electricity to travel 19.1 billion miles.[16] That accounted for just 0.15% of the total national energy generation that year.[17] In comparison, the U.S. produced 4,243 TWhs of electricity in 2022.

Estimates suggest that electricity providers will need to generate an additional 15-27 TWh (0.3%-0.6% new capacity per year) of new power generation between now and 2050.[18] However, this will not be the first time electricity providers have navigated increases in electricity demand brought on by new technologies. Similar spikes accompanied the popularity of now-standard appliances like refrigerators and in-home air conditioners.[19] Still, it will be important to ensure that providers and government agencies can work within their regulatory frameworks to test solutions and upgrade the grid to prepare for future demand increases accompanying greater EV adoption. History has proven that increases of this magnitude are possible. In the past, nearly 100 TWh have been added in a single year.[20]

—"Aren't we losing reliable sources of affordable baseload power, not adding to it, as we're putting more demand on the grid?"

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[15] 'Powering the EV Market: How Electricity Providers are Planning for the Future.' Zero Emission Transportation Association, (July 2023) https://www.zeta2030.org/policy-brief-powering-the-ev-market-how-electricity-providers-are-planning-for-the-future

[16] 'Assessment of Light-Duty Plug-in Electric Vehicles in the United States, 2010 – 2021,' Argonne National Lab, (November 2022) https://publications.anl.gov/anlpubs/2022/11/178584.pdf

[17] 'Electricity Overview,' EIA, (September 2023) https://www.eia.gov/totalenergy/data/monthly/pdf/sec7_3.pdf

[18] 'Summary Report on EVs at Scale and the U.S. Electric Power System,' Grid Integration Technical Team and Integrated System Analysis Technical Team, (November 2019) .https://www.energy.gov/eere/vehicles/articles/summary-report-evs-scale-and-us-electric-power-system-2019

[19] Ibid.

[20] Ibid.

Members of the Committee raised concerns that increased EV uptake will strain grid reliability. Several Committee members cited the North American Electric Reliability Corporation's warning of rolling blackout risks if we retire conventional baseload power sources.[21]

Expanding renewable energy and adding new, zero- and low-emission load-following resources like advanced nuclear, carbon capture, long-term energy storage, and green hydrogen will be key to effectively preparing the grid for EVs. In 2022, electricity generated from renewable sources surpassed coal for the first time in U.S. history.[22] At the same time, electricity providers are looking at ways to add low-cost energy storage to increase the availability of non-dispatchable renewable generation such as solar and wind. Currently, renewable energy generates about 20% of all electricity production in the U.S, and renewable sources like solar and wind are expected to account for the majority of new utility-scale electricity generation going forward.[23,24] Already, available renewable energy resources in the U.S. are estimated to amount to more than 100 times the nation's current electricity needs.[25]

> **Vistra Corp.** recognizes that the replacement of fossil fuel-powered assets with zero-carbon resources is not a one-to-one exchange. Vistra is working to maintain reliability by using energy storage and installing zero-carbon investments on the sites of retired or soon-to-be-retired fossil fuel plants. This also ensures that communities do not lose key energy supplies or ongoing tax revenue. Vistra is focused on ensuring that existing zero-carbon generation remains online, such as the Comanche Peak Nuclear Power Plant in Texas, which is currently going through the Nuclear Regulatory Commission's relicensing process to continue operations through 2053. This high-performing plant is able to produce power—rain, snow, or shine—increasing grid reliability for Texans and making it a keystone generator for the Electric Reliability Council of Texas (ERCOT) grid. Alongside the transition to cleaner generation resources, Vistra has been able to maintain reliability for its consumers and ensure that individuals and businesses are able to keep their lights on, even during extreme weather events. During Winter Storm Uri in Texas in 2021, Vistra's plants produced between 25-30% of the power on the grid during the storm, far beyond its ~18% market share.

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[21] '2023 Long-Term Reliability Assessment,' North American Electric Reliability Corporation, (December 2023) https://subscriber.politicopro.com/f/?id=0000018c-64e3-db4d-abac-efef87a50000&source=email

[22] 'U.S. renewable electricity surpassed coal in 2022,' Associated Press, (March 28, 2023) https://apnews.com/article/renewable-energy-coal-nuclear-climate-change-dd4a0b168fe057f430e37398615155a0

[23] 'Renewable Energy,' U.S. Department of Energy, accessed June 4, 2023 https://www.energy.gov/eere/renewable-energy

[24] 'Solar power will account for nearly half of new U.S. electric generating capacity in 2022,' EIA, (January 10, 2022) https://www.eia.gov/todayinenergy/detail.php?id=50818

[25] 'Renewable Energy Resource Assessment Information for the United States,' U.S. Department of Energy, accessed June 4, 2023 https://www.energy.gov/eere/analysis/renewable-energy-resource-assessment-information-united-states

Power generation is only one of the considerations when preparing for 100% transportation electrification. In particular, the industry needs to develop its ability to precisely manage demand in real-time, including by accurately predicting when and where increases in demand will occur.

> **Pacific Gas and Electric Company (PG&E)** uses geospatial forecasting to anticipate demand for EV infrastructure. Before, the company relied on customer requests for service to inform where EV load would materialize, leading to a less-than-optimal slow and reactive approach. The new forecasting approach was easily integrated with the existing distribution planning process and company software, leading to a much smoother implementation. PG&E also leverages the insights from the new forecasting method to produce directional assessments of the resources needed to support capacity investments that are accounted for in their capital expenditure planning. Ultimately, in light of this progress, PG&E continues to upgrade and refine its forecasting and planning capabilities to support its customers' transition to transportation electrification.

It is important to note that energy demand is not constant. Instead, it consists of relatively predictable peaks and troughs throughout the day. High demand consistently occurs between 5:00 PM and 8:00 PM each day, as customers return home, turn up their climate control systems, begin cooking dinner, and turn on other devices.[26] System demand peak is typically between 5:00-6:00 PM during the summer and 7:00-8:00 AM in the winter. As such, EV charging poses minimal impacts on the winter peak hours, but could increase summer peaks without managed charging. In light of that, electricity providers are looking at ways to reduce the impact of EV charging on these spikes in energy demand by studying the energy needs of their customers.

> In 2014, **Salt River Project** (SRP) launched "EV Community" (EVC)—a program that offers customers a $50 bill credit for each EV they register (up to two vehicles per household)—as a means to incentivize EV drivers to identify themselves and engage with SRP. Participants provide basic information about the electric vehicle and the type of charger they use. This provides a way for SRP to learn more about EV customers and their charging behavior and needs while offering them an incentive to help support EV growth in the region. There are currently more than 7,500 customers enrolled in the program. The EVC program also provides SRP with a method and channel to promote their Electric Vehicle Price Plan, a special time-of-use pricing plan which offers EV drivers the most opportunity to save on EV charging costs by charging during super off-peak times (between 11 PM and 5 AM). Load research has shown that this program has been highly effective at shifting EV charging loads away from peak periods.

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[26] 'Yes, the grid can handle EV charging, even when demand spikes,' Yale Climate Connections, (March 23, 2023) https://yaleclimateconnections.org/2023/03/yes-the-grid-can-handle-ev-charging-even-when-demand-spikes/

> In 2017, **Con Edison** launched SmartCharge New York program with the goal of instilling grid-beneficial charging behavior in parallel with the upswing in electric vehicle adoption. The goal was to influence driver behavior at the inflection point of transitioning from combustion-engine fueling to electric battery charging and have drivers "default" to grid-optimizing charging activity. Program participants received a free cellular-enabled device that plugs into the vehicle's diagnostic port. The device allowed Con Edison to track time, energy, and power consumed when charging in the utility's service territory. In addition, the SmartCharge New York program offers incentives designed to encourage drivers to avoid on-peak (2:00 PM—6:00 PM) electric vehicle charging during summer weekdays from June to September, and instead charge during off-peak hours (midnight to 8:00 AM).

—"Do you mean utilities would be able to draw down a homeowner's electric car battery from their garage and drain it to help the grid someplace else? …What happens when an owner of an electric car has an emergency at 3 AM, goes into their garage, and they find out their electric car is out of juice…?"

Vehicle-to-grid (V2G) technologies would not leave consumers with an uncharged vehicle, nor would it adversely impact them during emergencies. The electricity providers in ZETA's membership are emphatic that customer time-of-use and managed charging programs are voluntary.

V2G enables a bidirectional EV charger to supply power from an EV's battery to the grid via a direct current to alternating current (DC-to-AC) converter system, usually embedded in the EV charger. While bidirectional EV chargers are emerging products, all EV chargers contain internal converters. While value from managed charging can be obtained without V2G, V2G could eventually provide additional value to customers and the grid. When paired with managed charging, V2G technology can support the grid operator's ability to control frequency, respond to demand, and balance peak load.[27]

The strongest case for V2G integration is in long-haul trucking. These vehicles are permitted to travel a maximum of 10 hours a day, meaning they are parked about 58% of the time.[28] If connected to a smart grid, electric trucks could behave like a distributed energy resource (DER), offering V2G responses and energy transfers that could improve grid resiliency and facilitate

[27] 'Vehicle-Grid Integration Council,' Vehicle-Grid Integration Council, accessed November 12, 2021, https://www.vgicouncil.org/.
[28] 'Study of Adequacy of Commercial Truck Parking Facilities - Technical Report,' Federal Highway Administration, (March 2002) https://www.fhwa.dot.gov/publications/research/safety/01158/

bidirectional and smart charging.[29] **The amount of energy transferred from EV batteries to the grid would be limited, and participating vehicles <u>would not</u> be left without a meaningful charge.**

Integrating EVs into the grid may help meet local, regional, or national energy needs. Grid operators could manage their energy demand via range extenders, and energy storage and on-site generation capabilities may mitigate charging costs and enable electric trucks and buses to become grid resources.[30] V2G is still a nascent technology that has yet to see significant applications beyond school and transit buses, and applying V2G nationwide is a complicated endeavor that will require coordination and planning across a host of stakeholders. If successful, V2G can become an important tool for balancing load and conserving energy, especially when paired with expanded grid-scale battery capacity.

VI. EVs have proven lower life cycle emissions than comparable ICEVs.

—"Fossil fuels (coal, gas, and so forth) power the mining and transportation of raw materials for electric vehicles, for the manufacturing of the components for electric vehicles, the transportation of the assembled electric vehicles, the charging of the battery throughout the life of the electric vehicles and the eventual disposal of electric vehicles."

Studies have repeatedly demonstrated that EVs are cleaner than ICEVs from cradle-to-grave. Some notable examples include:

- The International Energy Agency's (IEA) 2021 report[31]
- Argonne National Lab's 2023 report[32]
- Renewable and Sustainable Energies Review's 2022 study[33]
- The International Council on Clean Transportation's (ICCT) 2021 white paper[34]

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[29] 'Electric vehicles standards, charging infrastructure, and impact on grid integration: A technological review,' Renewable and Sustainable Energy Reviews, (2019) https://www.sciencedirect.com/science/article/abs/pii/S1364032119308251

[30] 'Electric Truck and Bus Grid Integration: Opportunities, Challenges, and Recommendations,' CALSTART, (September 2015) https://calstart.org/libraries-publications-electric_truck_bus_grid_integration_opportunities_challenges_recommendations-sflb-ashx/

[31] 'IEA Global EV Outlook, Prospects for electric vehicle deployment,' (2021) https://www.iea.org/reports/global-ev-outlook-2021/prospects-for-electric-vehicle-deployment

[32] 'Cradle-to-grave lifecycle analysis of U.S. light-duty vehicle-fuel pathways: a greenhouse gas emissions and economic assessment of current (2020) and future (2030-2035) technologies,' Argonne National Lab, (November 1, 2023) https://greet.anl.gov/publication-c2g_lca_us_ldv

[33] 'Total CO2 equivalent life-cycle emissions from commercially available passenger cars.' Renewable and Sustainable Energies Review, (May 2022) https://www.sciencedirect.com/science/article/pii/S1364032122000867

[34] 'A global comparison of the life-cycle greenhouse gas emissions of combustion engine and and electric passenger cars', ICCT, (July 20, 2021) https://theicct.org/publication/a-global-comparison-of-the-life-cycle-greenhouse-gas-emissions-of-combustion-engine-and-electric-passenger-cars/

- The Science of the Total Environment's 2022 study[35]

VII. EVs are cheaper to own and maintain than their gas-powered counterparts.

—"EVs cost, on average, $7,000 more than a traditional vehicle, are more expensive to insure, and require more frequent replacements of tires and all component parts."

—"EVs are significantly more expensive, on average, than their ICE counterparts."

Several EV models already cost less than the average price of a new ICEV.[36] Furthermore, economies of scale and decreasing component costs are driving down the price of new EV models. The production tax credits from the IRA are expected to cut the cost of producing batteries and EVs even more, and these savings will benefit customers: with incentives for EV manufacturing, facility upgrades, critical mineral production, battery manufacturing, and battery assembly, the IRA subsidies could cut costs by up to $9,000 per vehicle.[37] As a result of these investments, the average purchase price of a new EV is expected to reach parity with new ICEVs in the mid-2020s.[38]

It is also important to note that—even with higher sticker prices—EVs cost less over their lifetime due to lower maintenance and fueling costs.[39] Drivers can receive $6,000–$10,000 in total cost of ownership savings by driving an EV.[40] Below, Figure 2 shows a graph from Argonne National Lab's 2021 study that breaks down the differences in maintenance costs between EVs and ICEVs.[41] These cost savings are due to the fact that EVs do not need oil changes, transmission fluid, fuel filters, coolant, or spark plugs like ICEVs require regularly.[42] Further, maintenance costs are generally lower because EVs have fewer moving parts and, therefore require less maintenance and fewer repairs.[43] A separate study in 2021 highlighted that EVs cost

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[35] 'Life cycle assessment of battery electric vehicles: Implications of future electricity mix and different battery end-of-life management', The Science of the Total Environment, (July 20, 2022) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9171403/

[36] 'These electric vehicles are cheaper to own than gas ones now,' Fox News, (June 13, 2022) https://www.foxnews.com/auto/electric-vehicles-cheaper-gas

[37] "Electric Vehicles Could Match Gasoline Cars on Price This Year," The New York Times, (February 2023) https://www.nytimes.com/2023/02/10/business/electric-vehicles-price-cost.html

[38] 'Accelerating to 100% Clean: Zero Emission Vehicles Save Lives, Advance Justice, and Create Jobs,' Environmental Defense Fund, (August 2020) https://www.edf.org/sites/default/files/documents/TransportationWhitePaper.pdf

[39] 'EV Ownership Costs: Today's Electric Vehicles Offer Big Savings to Consumers." Consumer Reports, (October 2020) https://advocacy.consumerreports.org/wp-content/uploads/2020/10/EV-Ownership-Cost-Final-Report-1.pdf

[40] Ibid.

[41] 'Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains,' Argonne National Lab, (April 2021) https://publications.anl.gov/anlpubs/2021/05/167399.pdf

[42] 'Are Electric Cars Low Maintenance?,' Progressive Life Lanes, accessed January 2024, https://www.progressive.com/lifelanes/on-the-road/electric-car-maintenance/

[43] 'Maintenance and Safety of EVs', U.S. Department of Energy Alternative Fuels Data Center, accessed January 2024. https://afdc.energy.gov/vehicles/electric_maintenance.html

31% less to service over their first three years compared to ICEVs and restated that EVs have both lower maintenance and repair costs than their gas-powered counterparts.[44]

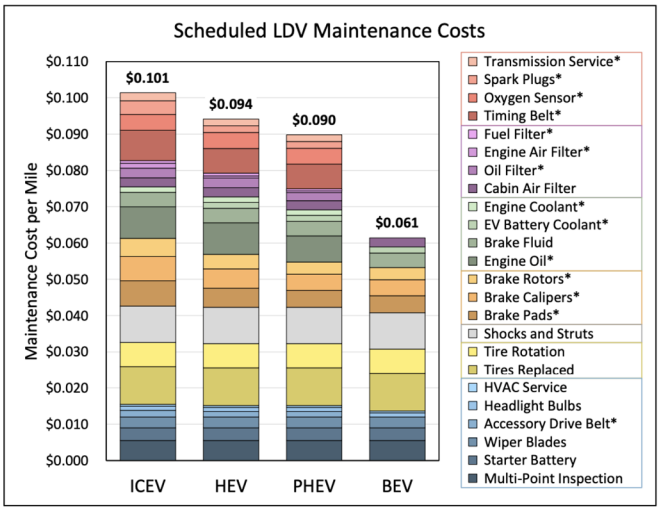

FIGURE 3.28 Scheduled maintenance costs for ICEV, HEV, PHEV, and BEV

Figure 2: Scheduled Light-Duty Vehicle Maintenance Costs

EVs are also cheaper to fuel because electricity prices are consistently cheaper than gas. In the past, ZETA tracked the cost difference on a monthly basis; our research found that EVs are 3-5x cheaper to fuel than ICEVs. On average, EVs can cost the equivalent of $2 a gallon or less to charge.[45] According to the American Automobile Association (AAA), over the course of a year, the cost of refueling an EV is around $546, compared to $1,255 per year when fueling a gasoline car.[46] EVs are not only cheaper to drive per mile, but their fuel costs are more consistent and predictable compared to similar ICEVs. Electricity prices tend to be less volatile and subject to fewer supply shocks than oil prices.[47] In this way, EVs provide American families with

[44] 'Electric Cars are more expensive to buy but cheaper to service than gas powered competitors,'Business Insider, (October 28, 2021)
https://www.businessinsider.com/electric-car-cost-less-service-maintenance-than-gas-cars-study-2021-10
[45] 'How Much Does It Cost to Charge an Electric Car?' Nerd Wallet, (September 29, 2023)
https://www.nerdwallet.com/article/loans/auto-loans/cost-to-fill-up-ev
[46] 'True Cost of Electric Vehicles,' AAA Automotive, accessed January 2024
https://www.aaa.com/autorepair/articles/true-cost-of-ev
[47] 'Energy Price Stability: The Peril of Fossil Fuels and the Promise of Renewables,' Roosevelt Institute, (2022)
https://rooseveltinstitute.org/wp-content/uploads/2022/05/RI_EnergyPriceStability_IssueBrief_202205.pdf

protection from fluctuations in oil prices caused by foreign governments and international conflicts.[48]

EVs will become even more accessible to American families as the used-car market grows. More than 70% of car sales in the U.S. are pre-owned vehicles,[49] and the emergence of a used EV market will benefit a broad range of customers.

VIII. The demand for EVs is accelerating rapidly.

—"The demand for EVs is stagnating."

EV sales grew 50% last year. This trajectory aligned with BloombergNEF's (BNEF) ambitious forecast for 2023.[50]

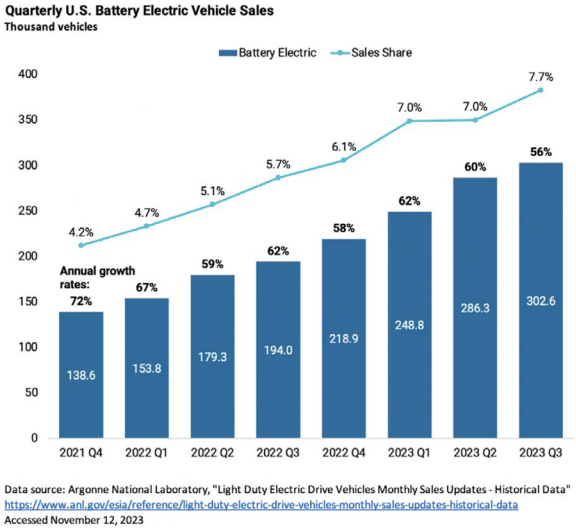

Figure 3: Quarterly U.S. Battery EV sales

[48] 'Gasoline explained,' EIA, (April 19, 2023) https://www.eia.gov/energyexplained/gasoline/price-fluctuations.php
[49] 'New and used light vehicle sales in the United States from 2010 to 2022,' Statista, (2022) https://www.statista.com/statistics/183713/value-of-us-passenger-cas-sales-and-leases-since-1990/
[50] 'Electric Vehicles Look Poised for Slower Sales Growth This Year,' Bloomberg, (January 12, 2023) https://www.bloomberg.com/news/articles/2023-01-12/electric-vehicles-look-poised-for-slower-sales-growth-this-year?sref=iW3WrQuv

As our country continues to transition to EVs and manufacturers bring newer, more affordable, and more advanced products to the market, we can expect consumer demand to continue trending upward. Several analysts have confirmed this:

- **S&P Global Mobility,** on the transition to EVs: "It's not going to be a tidal wave immediately. It's going to be a rising tide."[51]
- **Cox Automotive: "**Ballooning inventory has prompted automakers to reassess their EV launch timelines," but the pattern is similar to the ebbs and flows of gasoline vehicle production: "When you see that production [isn't] matching consumer demand, you adjust…Since this is such a huge transition, we're going to have all kinds of bumps in the road."[52]
- **Cox Automotive:** Cox expects automakers in the U.S. to sell more than 1 million EVs this year. That represents rapid growth. It took five and a half years to reach the first million EVs sold in the U.S., but the industry hit 2 million in December 2022—only 18 months later. Now, it will only take 12 months—by the end of this year—to reach 3 million.[53]
- **AutoForecast Solutions:** Even as automakers revise their investments and EV rollout timelines, their ultimate electrification goals are unlikely to change. In 2027, when GM and Honda once planned to launch EVs priced less than $30,000, there likely will be a market for low-priced EVs. If automakers give up now when the market is less stable, they will fall behind in a few years.[54]

IX. Charging infrastructure deployment has kept pace with EV deployment and investments included in the BIL and IRA will be critical to increasing the deployment rate.

—"It'd be reckless and irresponsible to force Americans to purchase these vehicles…and then leave them without a way of charging them."

The number of chargers in the U.S.—public, private, and residential—is on track for rapid growth in the next several years. To meet the Administration's goal of deploying 500,000 chargers by 2030, DOE's Alternative Fuels Data Center (AFDC) notes that the deployment rate will have to significantly increase. As discussed, public funding is helping to spur deployments, while private investment in public EV charging has increased considerably in the last five years, rising from under $200 million in 2017 to nearly $13 billion by early 2023.[55] Growth tracked by

[51] 'EV transition slows as inventory grows and industry hits hurdles,' Automotive News, (October 31, 2023) https://www.autonews.com/retail/ev-transition-slows-amid-inventory-woes-sluggish-demand
[52] Ibid.
[53] Ibid.
[54] Ibid.
[55] 'Investment in Publicly Accessible EV Charging in the United States,' Atlas Public Policy, (2023) https://atlaspolicy.com/wp-content/uploads/2023/05/Investment-in-Publicly-Accessible-EV-Charging.pdf

the AFDC found that between 2015 and 2020, the number of EV supply equipment (EVSE) ports in the U.S. more than doubled, and in 2021, the number of ports grew 55% year-over-year.[56]

Even without incentives, however, EV charging has generally kept pace with the rollout of EV deployment, as shown in Figure 4 below.

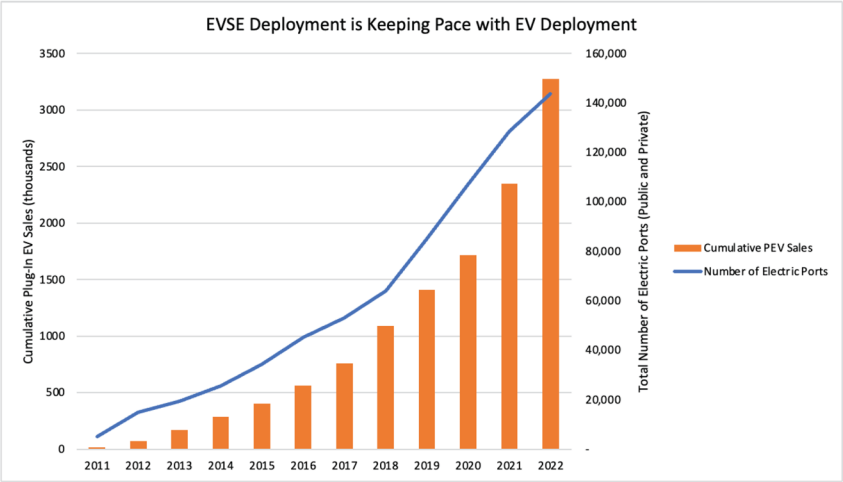

Figure 4. Trends in Light-Duty EV Deployment vs. Public Charging Infrastructure Deployment[57,58]

Deployments of both light-duty EVs and charging infrastructure have followed an upward growth trajectory in recent years. Deployments of both products are well correlated with a value of 0.982 between light-duty vehicles and EVSE ports. As such, recent trends suggest that charging infrastructure should not be a limiting factor in expanded EV deployment.

The tax credits provided in the IRA, specifically the Alternative Fuel Vehicle Refueling Property Tax Credit[59] are critical to helping ensure the continued availability of products necessary for a fully-electrified transportation sector. By targeting investments toward rural and lower-income

[56] 'Electric Vehicle Charging Infrastructure Trends,' Alternative Fuels Data Center, accessed January 2024 https://afdc.energy.gov/fuels/electricity_infrastructure_trends.html
[57] 'LDV Total Sales of PEV and HEV by Month (updated through March 2023),' Argonne National Laboratory, (March 2023) https://www.anl.gov/sites/www/files/2023-04/Total%20Sales%20for%20Website_March2023_0.pdf
[58] 'U.S. Department of Energy Alternative Fuels Data Center,' US DOE, accessed May 2, 2023 https://afdc.energy.gov/data/10964
[59] *See* 26 U.S.C. § 30C

residents, the credit incentivizes individuals and commercial operators to install charging stations at their homes and private entities. Retailers, local businesses, or commercial fleet operators can also utilize the credit to offset the costs of installing charging infrastructure on their property, enabling them to attract and retain customers.

Taken together, the funding in the National EV Infrastructure (NEVI) and Charging and Fueling Infrastructure (CFI) programs under the BIL and the Alternative Fuel Vehicle Refueling Property Tax Credit in the IRA will lead to a significant buildout of EV charging in communities, at homes and businesses, and along high-traffic highway corridors.

Conclusion

We thank the Committee for the opportunity to provide a statement for the record and for its commitment to policies that drive decarbonization, advance domestic manufacturing, and protect U.S. energy security. ZETA urges policymakers to protect the historic investments made in the EV and battery industries. Efforts to repeal the EV industry provisions in the IRA would have a cascading negative effect throughout the minerals, battery, and automotive segments of the economy—impacting hundreds of thousands of jobs and billions in private investment. ZETA looks forward to continuing its work with the Biden-Harris Administration to ensure that the industry perspective informs IRA implementation and the transition to EVs.

Sincerely,

Albert Gore
Executive Director

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