

Business, Energy and Industrial Strategy Sub-Committee on National Security and Investment

Oral evidence: The national security and investment
screening system, HC 944

Tuesday 6 December 2022

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Members present: Darren Jones (Chair); Bim Afolami; Alan Brown; Ruth Edwards; Ian Lavery; Andy McDonald; Alexander Stafford.

Questions 1 - 38

Witnesses

I: Paul Lusty, Director, UK Critical Minerals Intelligence Centre; Paul Atherley, Chair, Pensana, and Non-Executive Chair, Alkemy Chemicals.



Examination of Witnesses

Witnesses: Paul Lusty and Paul Atherley.

Q1 Chair: Welcome to this morning's session of the National Security and Investment Sub-Committee of the BEIS Committee for our hearing on critical minerals and the National Security and Investment Act. We have two witnesses with us this morning. Good morning to you both. We have Paul Atherley, who is the chairman of Pensana, a company which, according to my note, imports and processes rare earth oxides; and Paul Lusty, director of the UK Critical Minerals Intelligence Centre, which is an independent analytical body. Thank you to both of you for coming and joining us this morning.

To kick us off, could you give us a summary of which bits of the UK economy are particularly exposed to or dependent on the supply of critical minerals, and of how this might change in the future?

Paul Atherley: By way of background, I am also chairman of a company called Tees Valley Lithium, which has recently had planning approval for Europe's largest lithium refinery, in Teesside. Also, Pensana is constructing a world-class rare earth separation facility in Humber.

To answer your question about why it is important for the UK, the energy transition we are experiencing is the biggest in history—transitioning away from fossil fuels to a new form of energy and a new form of transport. The new form of energy we are seeing in the UK is offshore wind, and the transport is electric vehicles; you can add to that solar panels.

To give you some idea of the scale, existing electricity generation capacity in this country is around 65 gigawatts; if you believe the words of one of our recent former Prime Ministers, the Saudi Arabia of wind that is going into the North Sea is 50 gigawatts. This scale is absolutely enormous. If we are going to phase out fossil fuel cars by 2030 for electric vehicles, that is also a major industry scale. The critical minerals that we are talking about today are fundamental to energy transition and to the transport sectors.

Q2 Chair: Paul Lusty, is there anything beyond energy and transport that we need to be thinking about?

Paul Lusty: To reiterate, minerals are vital to every aspect of our daily lives. The UK is a significant net importer of many minerals and metals. When we looked at critical metals and minerals, it is approaching almost 100% for most of those commodities, which, as Paul indicated, underpin strategic industrial sectors—for example, the expanding automotive sector, with a view to electrification of transport. The need to meet net zero targets is potentially threatened by restrictions or limitations on the availability of those minerals and metals entering the UK economy. If we look at strategically important metals for aerospace and defence applications, for example, we are again dependent on international



imports for the raw materials that potentially underpin national defence applications.

Q3 Chair: Which type of minerals are we most exposed to in terms of political risk around defence requirements?

Paul Lusty: If you look, for example, at the metals used in superalloys for aerospace and defence applications, many have fairly opaque markets, characterised by significant price volatility, owing largely to the relatively small volumes in which they are traded internationally and by production concentration. Restrictions on production in a small number of countries or in the hands of a small number of companies give those countries greater influence over supply into the market and pricing of those commodities. These are things like vanadium, hafnium and rhenium, which are all important metals in superalloys.

Q4 Chair: China in particular has a lot of capacity in the critical mineral supply chains that you just mentioned.

Paul Lusty: China is a very significant producer of many critical minerals and metals. For example, of the list of the UK's 18 critical minerals and metals, China is the top producer of 12.

Q5 Alexander Stafford: The critical minerals strategy notes that the Government have powers to intervene in acquisitions in the critical minerals sector where there are national security concerns. What would you say are those concerns, and what power would the Government use to intervene? Would they stop things? Would they requisition things? Can you talk a bit more about that part of the strategy, please?

Paul Atherley: Maybe I can add to what Paul was saying from a military perspective. Critical minerals are also important to military, medical, industrial and communications, as well you know, Mr Stafford, and it is not just the new technologies. In answer to the question of which ones are really important to us right now specifically for military, it is all those that go into those sectors, specifically things like rare earths for permanent magnets and all the metals that Paul mentioned.

On your question about how we regulate it in relation to this particular Act, the first thing that we need to do is to establish independent, sustainable, resilient supply chains for the UK. At the moment, we are sitting here totally dependent on China for many of these supplies. You may be aware that the US, Australia, Canada and the EU have already identified this concern and are applying not just regulatory change but also very large sums of money to address that concern.

Q6 Alexander Stafford: What is the most particularly critical mineral that you are worried about, if there was only one to choose from? You mentioned superalloys, Paul, but is it lithium?

Paul Atherley: It is absolutely permanent magnets. To give you some idea, an electric vehicle can have any form of electricity generational



storage that you like; it could be a lithium ion battery, a fuel cell or a sodium ion battery. But what makes an electric vehicle go is the electric drive unit, which is an axial motor that has a copper coil with rare earth permanent magnets. The only reason that we have offshore wind that works so well in this country is the transition from onshore wind turbines to offshore wind turbines. That was due a number of technology advances over the last five years, the biggest one of which was direct drive turbines. This is a copper coil being rotated inside seven tonnes of permanent magnets.

Without those magnets, we do not have offshore wind turbines. Without those magnets, we do not have electric vehicles. Without those magnets, we have problems with communications, industrial and medical. As we saw in the US, F-35 jets do not take off without rare earth permanent magnets.

Q7 Ruth Edwards: The Government's critical minerals strategy acknowledges that supply chains are quite opaque and there is a lot of information that is hard to come by. Could you give us some examples of the types of information that are difficult to get?

Paul Lusty: One of the key roles of the Critical Minerals Intelligence Centre is to provide impartial advice, information and data to underpin Government decision making around that topic. One of our key roles is to better understand, as you say, these complex and dynamic international supply chains that often lack transparency.

There are lots of challenges around data, particularly for many of the minor metals. Even information around pricing can be problematic in terms of maintaining good-quality price information to understand price volatility, which has implications for consumers of those raw materials. Trade data on some of these materials is also very poor. We do not necessarily have the granularity in the import trade statistics to truly understand what quantities of some of these minerals and metals the UK is importing, in what forms, and in which industrial sectors they are being consumed.

Q8 Ruth Edwards: Is it realistic to have as a goal of the strategy that we would be able to get that kind of information and have more transparent supply chains? Can you see a way around the problem?

Paul Atherley: Part of the investment in companies like Pensana's rare earth separation facility and Tees Valley Lithium's lithium refinery is that we have to have a thing called lifecycle analysis. When we sell to a car manufacturer, we have to show from the origin of the material all the way through to the production, so that is complete transparency. They look for three things. They look for price, they look for transparency, and they look for low embedded carbon. We have to demonstrate those three things.



I agree completely with Paul that we do not have good data or information on the existing supply chains, because they are heavily concentrated in one country to which we do not have access, but we can establish new production and new resilient supply chains that are independent, sustainable and freely accessible to third-party verification.

The concept is that if we are going to do the midstream processing in this country, we need to capitalise on our chemical engineering history and our chemical engineering excellence. We have a world-class chemical industry and a world-class offshore wind generation capacity being developed. Put those together with freeports and we will have an opportunity to leapfrog the Chinese in the midstream by producing low-embedded-carbon critical minerals for the downstream industry.

To your point, we need to source the material to feed that from parts of the world where we could have full transparency. Part of the critical minerals strategy talks about collaboration with international parties, and we are very fortunate that we have great relationships with some of the great mining countries and continents of the world—Africa, Australia, South America and North America—which happen to be home to enormous resources of exactly the critical minerals that we need to process.

Our thesis is that we can mine around the world. Let us use the UK's two great advantages, which we see as chemical parks and bad weather. Let us put those two things together and we can create the resilient supply chains that we are looking for.

Q9 Ruth Edwards: Would it be fair to summarise your view as being that we will not get transparency on existing supply chains and that it is about creating new ones with different partners?

Paul Atherley: Absolutely, yes.

Q10 Ruth Edwards: In terms of the different critical minerals that you have assessed at the Critical Minerals Intelligence Centre, are there any minerals where the supply chain is particularly opaque, or is it fairly uniform across the board?

Paul Lusty: Going back to the example of rare earths, back in 2010 about 97% of global rare earth production was concentrated in China—that is mining, processing and refining capacity. You can clearly understand from a security of supply perspective that having that level of production concentration is a severe risk to the market.

There have been global developments with, for example, the opening of mines in Australia and of processing capability in Malaysia; the US has also attempted establishing a domestic rare earth processing capability. As a result, the Chinese dominance of that market has been slightly eroded, but it still probably stands in the order of 80% of global rare earth supply.



There are opportunities to diversify international supply chains. Going back to what Paul mentioned in terms of international co-operation, there is currently a lot of emphasis on that topic in dialogue between the United States, Canada and Australia, for example. We are also supporting UK Government in facilitating that dialogue about establishing new, more diversified supply chains. The real challenge for the UK and those other countries is the potential timescales for realising those supply chains outside China.

Q11 Ruth Edwards: Thank you, that is really helpful. The Government's strategy is around enabling the UK to keep pace with other countries. Where would you say the UK is in comparison with partners overseas in terms of its mineral supply and security?

Paul Atherley: We are coming late to the party. To give you some idea, the UK has various agencies that provide funding—the ATF, the industrial energy transformation fund, the energy-intensive industries scheme, the national security scheme, the UK Infrastructure Bank and UK Export Finance—but if you add all those up, they pale into insignificance compared to what is happening among our rivals. The US IRA—Inflation Reduction Act—is \$396 billion. If you take, even on a smaller scale, a regional grant like the northern Australia infrastructure facility, it is Aus\$3.96 billion. These numbers are enormous, recognising the same problem.

We are late to the party. We have not put the money where we need to. I am aware that the critical minerals strategy implementation plan has not been put in place yet, so I am pitching for that, but I would say that we have phenomenal advantages in this country. I keep making this point. We have freeports, chemical parks and 50 gigawatts of ultra-cheap offshore wind. Last year, we had 60 days of negative electricity prices.

We can capitalise on that, put it into our chemical parks and be the processors of those raw materials. We can take the mined product from Australia, from Africa, from South America and from North America, and rather than it all being shipped to China and processed in their midstream industry, we can capitalise on our chemical engineering industrial heritage, chemical parks, freeports and offshore wind, and leapfrog the Chinese.

Q12 Ruth Edwards: Paul Lusty, Paul mentioned the US and Australia as leading countries. Are there any other great examples that the UK should be looking to?

Paul Lusty: There are many countries with which we could potentially develop strategic partnerships around critical raw materials. Again, we have to look to who the key players are in terms of dominating supply for many of the commodities of interest. For example, if we look at platinum group metals, South Africa is the world's leading producer of platinum. Only a couple of weeks ago, there was an announcement from the UK

Government about developing a stronger trade relationship with South Africa over critical metals.

Then you consider the importance of those relationships further downstream. If we are looking to develop a low-carbon hydrogen economy in the UK, secure supplies of elements like platinum are going to be vital for realising that within the UK. You could also look further afield to countries like Brazil, which have huge raw material endowments of very significant rare earth resources that are underdeveloped. Again, there are opportunities to engage on that front.

As I mentioned earlier, there are ongoing discussions with other major mineral producing countries such as Australia and Canada, which have very similar values to the UK in terms of our expectations around responsible sourcing and sustainable production.

Q13 Ruth Edwards: Paul, if there was just one thing missing from the current strategy that you, as a business operating in the sector, would like to see, what would it be?

Paul Atherley: It would be accelerated funding from Government to develop this midstream.

Q14 Ruth Edwards: The Committee has just done a report on semiconductors, and everyone is very aware that roughly 40% of the world's palladium supply comes from Russia. How have you seen the global market respond to that? How has that impacted the availability of palladium? Are alternative supplies there in the short to medium term?

Paul Lusty: You are absolutely right to point out the dominance of Russia in terms of supplying around 40% of the world's palladium to the global market. There were concerns earlier in the year, which were exemplified by nickel price volatility when the London Metal Exchange suspended trading of nickel for a short period, because of concerns around potential Russian sanctions at that time.

It has transpired that the LME went out to consultation around applying sanctions on Russian export metal commodities, and there was a decision not to interfere with that market. It is my understanding that that supply has continued to feed the international market.

Q15 Alan Brown: Paul Lusty, we are talking about supply chain opaqueness and our reliance on certain countries. I understand that, in the past, there has also been reliance on traders that would buy up rights to certain minerals and thereby corner the market. Is that still an issue or is that no longer a concern?

Paul Lusty: We certainly see elements of speculative trading within some parts of the critical minerals markets. Again, the risk associated with that is not aided by the lack of transparency in these markets, the very small quantities that some of these minerals and metals are traded in, and prices not necessarily being transparently reported on exchanges.



- Q16 **Bim Afolami:** Paul Atherley, you talked about investment from Government. I am at risk of sounding heretical as the free marketeer that I am, but can you think of a good reason why the Government should not just invest in significant numbers of companies that are seeking out critical minerals all over the world and do the investment in that way, rather than fund private businesses to do that?

Paul Atherley: Thank you for the question. It is a good question. The reality is that we are not short of critical minerals around the world. It is not finding or mining it that is the shortage; it is the midstream and the processing. We need to wrest away from single sources of concentration and bring processing to the UK, capitalising on our chemical engineering heritage and linking up with offshore wind.

That would be the best use of Government funds, not least because it would be investing in the UK, creating jobs here and possibly even levelling up. There is a lot of money being invested by other Governments into mining and developing critical minerals around the world. The bit that is missing—and I keep making this point—is the midstream processing.

- Q17 **Bim Afolami:** Notwithstanding that, you can see the attractions of owning part of the supply chain, so that when you do invest in that midstream processing, you have security of a diverse supply, depending on what you have invested in. Can you not appreciate that point as well?

Paul Atherley: Very much so, I would welcome Government investing alongside us, as you may be suggesting.

- Q18 **Bim Afolami:** Yes. I am not suggesting 100% ownership, but taking stakes.

Paul Atherley: There is a history in this country's critical industries where Governments have stepped in for periods of time to establish the industry, get it going and then pass it off into private hands down the track. To that extent, I would agree that that would be a welcome and sensible policy.

- Q19 **Bim Afolami:** What impact has the NSI Act had on investment in the sector overall, in your opinion?

Paul Atherley: Very little, from our perception, but it has—this is probably why we are sitting here today—made everybody critically aware of the importance of these minerals to a range of sectors. We are talking about it today; we have had a critical minerals policy. As Paul and I were discussing earlier, five years ago no one was talking about minerals and the importance of them. We allowed the production of these now critical minerals to be concentrated in other hands. We are now recognising that that is no longer a sensible thing to allow, and we need to address it.

- Q20 **Bim Afolami:** Bearing in mind that it is Christmas and we are all looking for Christmas present ideas, Paul Lusty—you can see where I am going



with this; it is a serious question, I assure you, Chair—other than *The Rare Metals War*, what books should we read about this subject that would inform us?

Paul Lusty: A fantastic, high-level overview is the *Critical Minerals Handbook*, which was published in collaboration between Wiley-Blackwell and BGS. It is certainly due for an update, because it was published six or seven years ago, but it gives an excellent introduction to the topic, particularly in terms of the concept of criticality, how that can be assessed, and how it is very much dependent on the perspective of the organisation or country that is conducting the assessment.

Something that we always point out is that, because of the dynamic nature of supply chains and commodity markets, criticality assessment only ever represents a snapshot in time, meaning that it is important to review and frequently reassess our exposure and risk to supply chain vulnerabilities.

Q21 **Bim Afolami:** Paul Atherley, do you have any reading recommendations?

Paul Atherley: Apart from the chairman's statement in Pensana's annual report, Paul has covered it.

Q22 **Chair:** Paul Atherley, I just want to push a little bit further on the business case. Interestingly, Bim is offering a blank cheque from the Treasury, so I just want to balance out the political discussion here.

Bim Afolami: Sorry, I was sounding like you, Andy.

Chair: If midstream processing is such a good opportunity, why is private finance not paying for it?

Paul Atherley: We are. We are moving ahead very strongly with it. Again, as another positive of the UK, Tees Valley Lithium has gone in 18 months from a zero position to having full planning permission in the Wilton International chemicals park within the Teesside freeport, whereas other lithium refineries around Europe and the world take much longer.

We are moving full steam ahead, and we are accessing the capital markets for that. As Mr Afolami knows, rare earths are a lot more complex to finance. I would suggest that lithium is a lot easier to finance. When I say that we need assistance, we need assistance in areas where there is a difficulty in financing and where it is very obvious that the traditional forms of financial market support are not there. That is the only circumstance in which we would come to Government and say we need assistance.

Q23 **Chair:** Could you give me an example, just so I understand that? Is there a particular type of material that normal private sector financiers do not want to finance, and if so, why?

Paul Atherley: There are two reasons why. One is because a financier will typically say, "Show me your offtake contracts for your product," so if your offtake contract is a field of dreams of electric vehicles yet to be



built, or of offshore wind turbines yet to be constructed, you do not have an offtake contract to go to a financier with. Secondly, they look at supply. If your supply is from a part of the world that they are not comfortable with, you are not going to get finance. That is a very good example of where Government can step in.

I welcome the critical minerals strategy in this context of collaboration. We have fantastic resources around the world in countries that this Government can collaborate with—Australia, Canada, the USA and a large number of countries in Africa. We need to build on the excellent work that UK Export Finance is doing and pull that together to bring the midstream.

When we talk about Government finance, it is not necessarily asking for a big blank cheque to be given to the corporate sector. To be frank, it is more that, when UK Export Finance or the automotive transformation fund go through their five-step procedures and end up in Treasury, it is like fighting through trenches in the First World War to get money out of it. Treasury, with respect, is a bit of a battleground for all of those funds. Expectations of the allocations from Treasury to those agency funds have been reduced, not increased, and they have been delayed. When we go to them and say, "We would like funding for these very good reasons," they say, "I'm sorry, but our allocation is lower than we expected and has taken longer and, by the way, there are 30 other companies in the queue trying to get the same thing."

In answer to the question from Ms Edwards, I said that we need accelerated funding. It is not just funding. It needs to be accelerated. It needs to be available in a timely manner to be able to make that happen.

Q24 Bim Afolami: I will just ask a question to the left of my Labour Chair. For me, it is not really about the money, but about the control. As you both have described, there is a real war going on internationally to get reliable access to certain minerals. If the British Government are not playing their full part in that, notwithstanding the private sector being willing to invest, there is the risk that, as a country, we do not have access to things at the right time. Is that a fair concern?

Paul Atherley: Absolutely, yes. Immediately on the publication of the Inflation Reduction Act in the US, President Macron flew to the US and met the President of the United States to protest against what he saw as, effectively, subsidising a critical minerals strategy or electric vehicle strategy in the US at the expense of the European Union. We are in a battle right now, and right now we are not at the table; we are not even on the field. We need to get there; otherwise somebody else will capture these supply chains.

Q25 Alan Brown: Paul Lusty, if the intelligence centre revises the list of critical minerals, is there a mechanism for this to be reflected in the list of materials and sectors where transactions need to be notified to the Investment Security Unit?



Paul Lusty: I am unclear on the basis for the list that is included in the National Security and Investment Act documentation that I have read. The Act predates the release of the UK critical minerals list, which BGS published and I was the lead author on, because that was handed to Government at the end of last year and put into the public domain only in July 2022.

There are some discrepancies between the 18 minerals that are on the UK critical minerals list that we produced and those listed in the Act. There are very simple explanations for some of them. There are far more minerals listed in the Act, because some of the commodities, such as the rare earth elements, of which there are 15 lanthanides plus scandium and yttrium, are dealt with individually within the Act, whereas we dealt with them as a single group. It is the same with the platinum group metals; they are listed individually in the Act, whereas we dealt with them just as platinum and palladium, so there are differences.

Clearly, the UK criticality list is based on a systematic and quantitative assessment of supply risk to the UK economy. As I say, I am unclear what the basis is for drawing up the list within the Act. There are also certain commodities on the UK critical minerals list that do not appear in the Act, so it would be logical to attempt to align the minerals and metals that are listed in the Act with the quantitative assessment that has been produced by the British Geological Survey, bearing in mind that we are currently embarking on a process of review and optimisation of the methodology, with a view to publishing a revised and probably longer list in spring of next year.

Q26 **Alan Brown:** What needs to be done to bring that alignment together?

Paul Lusty: I envisage that there needs to be some discussion between those who developed the Act, so that we can clearly understand what the rationale is for the list that features in the Act. Now that they have access to the UK criticality assessment results, they can reflect on that.

There is also potentially an issue of timing. As I understand it, the Act will be reviewed on a three-year period. Because of the dynamism within critical minerals markets that I mentioned earlier, we plan to review and update the UK critical minerals list annually to reflect those changes in supply risk globally.

Q27 **Alan Brown:** Should any consideration be given to harmonising the timing, given that the minerals list is going to be updated annually? Should the timeframes be aligned as well, or harmonised?

Paul Lusty: As I suggested, given the complexity of global supply chains and how rapidly geopolitical circumstances can change, with an impact on supply chains, as we have seen with the Russia-Ukraine war and the impact on some commodities coming into the market, it would be prudent to review the list of commodities on a more frequent basis than three years.



Q28 Alan Brown: Just on geopolitics, you mentioned Russia, and you mentioned energy earlier on. Nuclear energy is completely reliant on the supply of uranium. Russia and Kazakhstan are major suppliers of uranium. While the UK may not buy uranium directly from Russia, EDF in France certainly relies on Russia. Should the UK and the EU be working together to look at that, given that we are supposed to have sanctions on Russia? It seems a bit strange to be relying on Russia to supply uranium for major energy infrastructure.

Paul Atherley: My understanding is that uranium ore is supplied to people who make uranium fuel, and the fuel then goes into the various reactors. My understanding is that there are only three or four uranium fuel production facilities, one of which is in the European Union, and I understand that there is a level of co-operation there. To your point, though, Kazakhstan is dominant in the mining side of it, so, if we were to make that supply chain more resilient, we would look for more mining to supply the existing Canadian and European fuel processing facilities.

Q29 Andy McDonald: Just picking up on that, Paul Lusty, you mentioned alignment. Magnesium, silicon and tin are specifically identified as critical minerals in the Government's strategy, but they are not listed under the regulations. Do I take from what you have said that that should be corrected?

Paul Lusty: As I mentioned, this could be partially a function of timing and the chronology of when these documents were drafted and released. The Act was published during 2021. The UK critical minerals strategy postdated the release of the critical minerals list, and the two should not be confused with one another. They are completely separate documents with different purposes. The purpose of the UK critical minerals list, which was commissioned by BEIS around this time last year, was to inform and act as a basis for the development of the strategy. It is those 18 minerals and metals that feature on the UK critical minerals list that are emphasised within the UK Government's strategy document.

Q30 Andy McDonald: Tin is one such material, and yet something that we could produce in the UK. China regards it as a critical mineral. Should we be upping our game in terms of regulation?

Paul Lusty: You are right to point out that, historically, south-west England was a globally very significant tin producer. There are certainly opportunities to better understand UK domestic resources of many critical minerals and metals. That is a programme of research that the British Geological Survey is currently undertaking, which directly aligns with and supports the critical minerals strategy.

Tin is one example of a mineral or metal that we are considering as part of that assessment, alongside metals such as tungsten, which also occurs in south-west England. There is currently probably most interest in south-west England focused on the potential for producing lithium from



resources that are being explored. If we look to Scotland, for example, there is potential for nickel production in the longer term.

- Q31 **Andy McDonald:** Paul Atherley, with you being here, it would be remiss of me not to have welcomed the Tees Valley lithium initiative and the hundreds of jobs that that will bring. You identified permanent magnets as the big issue for you. Can you say a little bit about the recovery of lithium from the sea? It is something that I have heard about. I express my ignorance here, but there appears to be a patent available for the retrieval of lithium from seawater. Is that a relevant part of your business? Do the North Sea and perhaps waters off the Cornish coast provide some opportunities for you?

Paul Atherley: That is a really relevant question. In terms of the scale of the critical minerals that we are talking about, the one with the biggest shortage is lithium, by far. Depending on who you refer to, we need something like 60 times more lithium than is currently being produced. It is orders of magnitude—the shortfall is enormous. Because of that, we are looking at various ways of sourcing lithium. There is hard rock lithium, which is predominantly from Australia; there is lithium from salt lakes in South America; and, as you rightly point out, we have lithium in brines, where the lithium is concentrated in solution. My understanding is that the lithium in brines is restricted to water that has been recirculated in, in the case of Cornwall, deep Devonian granite magma flows. There has been a reconcentration to levels much higher than seawater, but not that much higher. Right now, we are going through a process of proving up DLE—direct lithium extraction—from a brine, which is the technology that you are referring to, and that is very close. We are seeing brines in Germany being developed. Some great work is being done by Cornish Lithium. Jeremy Wrathall, a friend of mine, is doing some fantastic work there on direct lithium extraction.

To your question of whether we could translate that into the North Sea, probably not just yet, simply because the seawater concentration of lithium is lower than the concentration in brines in South America and the brines in Cornwall.

- Q32 **Andy McDonald:** There are a lot of spoils from North Sea oil and gas activity.

Paul Atherley: I would love it. Putting some electrodes in the North Sea and pulling out lithium would be the perfect complement to the offshore wind turbines. We could create an industry on the back of this, which would be great. You are right in pointing out that the biggest gap by far in critical minerals is lithium. That is why it is called the new oil; I think you are aware of that. The new fuel for electric vehicles is lithium and there is massive shortage of it, which is why everybody is looking, as you rightly point out, at many different sources for it.

- Q33 **Chair:** I was at a conference the other week where they were talking about asteroid mining, but that might be for another day. I want to ask



about these lists, just to make sure that I have it clear in my head. There is an industry list of critical minerals, which you helped put together with your work, Paul Lusty. Then there is the Government list, and then there is the list within the National Security and Investment Act and its regulations. Have I understood correctly that there are three separate lists?

Paul Lusty: In November 2021, BEIS put out a competitive tender to produce a UK criticality assessment and draw up a list of critical raw materials for the UK. BGS tendered for that work, and we subsequently produced a list of 18 critical raw materials for the Government. That list was used as a basis for producing the critical minerals strategy. Those minerals that feature and are listed in the critical minerals strategy are those same minerals and metals that feature on the list that we produced.

It is unclear on what basis the commodities that appear within the National Security and Investment Act were derived. There are no great surprises in terms of the minerals and metals that are listed there, but they do not entirely align with those on the critical minerals list.

Q34 **Chair:** I have no idea what hafnium is. I have been told that it has been identified in the EU, the US and Australia as a critical mineral, but it is neither in our critical minerals strategy nor in our National Security and Investment Act. Taking hafnium as an example—perhaps you will tell me what it is as well—why would it be the case that, in the UK, we are not worried about it, but our allies are?

Paul Lusty: Hafnium is a minor metal that is important in specialist alloys. Its security of supply risk primarily results from it being a by-product of zirconium mining. By-product production is a security of supply risk and a characteristic of many critical metals: they do not have their own production infrastructure, so their production is dependent on the production of a major carrier metal, as we term it, which market economics result in the production of.

The UK criticality list is not exhaustive. Because of the timescales it was produced in—about a six-week period around this time last year—we started with a relatively small list of candidate materials. Going forward, as I said, we plan to review the methodology and produce an updated list, which will certainly consider a much broader suite of candidate materials, including metals such as hafnium.

Chair: Hafnium is one to watch.

Q35 **Ian Lavery:** The discussion about lithium is very important, and significant for me. I have the proposed Britishvolt gigafactory in my constituency, and there is a great need for lithium. Probably for another time, Chair, is what challenges that might bring to these gigafactories, which will need lots of lithium to produce and manufacture electric batteries.



The Act covers businesses that are connected to the UK. Do the Government's powers under the Act extend far enough down the critical minerals supply chain to address the risks that they face?

Paul Lusty: Reflecting on that question and the nature of the international supply chains that we are dependent on, there are certainly parts of the supply chain, whether that be the primary mining or the processing and refining of many of these commodities, that are very distant from the UK market.

Going back to some of our discussion points earlier, that results in a lack of transparency and understanding of which state actors are involved in specific parts of those value chains and how changes that they might implement could affect security of supply in the broader global market, as well as the UK.

Q36 **Chair:** The answer is no, basically, but there is not much that we can do about it, because if China buys a company in Kazakhstan, that disrupts our supply chain.

Paul Lusty: There are two aspects to it. We fundamentally need to improve our understanding of the global supply chains that the UK is dependent on, our visibility along those supply chains, and our understanding of the overall resilience and the vulnerabilities. We do have to also look beyond the Act, potentially, at how we can intervene. We talked earlier about financing, which is very important, but there are other mechanisms for the UK to work with international partners to strengthen supply chain resilience, for example around trade agreements with key producing countries.

The UK and the geological survey particularly do a lot of work around exerting what you might term soft power in major mineral producing countries. Currently, for example, we are undertaking work around lithium resources in Ghana, but we are also doing a lot of work in the lithium triangle in South America, trying to enhance environmental and social standards associated with lithium production there. There are a lot of options for the UK in its potential toolbox to intervene in de-risking global supply chains for some of our critical raw material supplies.

Paul Atherley: If I could add to that in answer to the previous question, we have to look at lifecycle analysis. I will give you an example. We have proposed legislation in the European Union on the carbon border adjustment mechanism, which says that, basically, it is unacceptable to extract raw materials unsustainably and to import them into the European Union for the green economy. We have to mirror that and say that, if we are going to have sustainable supply chains, sustainability has to include considerations under the National Security and Investment Act. It is not hard to do. We should not be importing material into this country, either as an end product or as a midstream product, that does not meet the highest sustainability and ESG guidelines. That could



perfectly reasonably include aspects of the particular legislation that we are considering today.

Q37 Ruth Edwards: I have a final supplementary on the issue of resilience of supply chains. We discussed palladium earlier. If Russia had decided to weaponise it by restricting supply in the way that it has with gas, or were it to do so in the future, what kind of impact would that have on the global market? With that kind of situation in mind, are there any minerals on the UK's criticality list where the supply chain is suffering from a particular lack of resilience or redundancy, such that, if there was a sudden shock in terms of either supply or demand, there would not be alternative sources that we could go to?

Paul Lusty: There are commodities where you have very high production concentration, either in a single country or, in some cases, in a single company. For example, look at niobium production, where Brazil vastly dominates global supply. Rare earths are another good example, because of the significant concentration of the value chain currently in China. A significant restriction of flow of material into the market from those countries would see short-term deficits with significant impacts on price volatility.

Reflecting on the question that you posed specifically about Russia, there are two ways that that could impact on the market. From the Russian perspective, deciding to withhold supplies to the international market could upset the market balance. Equally, it could come from western sanctions on Russia restricting their entry into the global market, again with implications for supply and demand.

Paul Atherley: I will just bang this drum again and say that we have to look to the midstream. If you wanted to weaponise lithium right now, more than 90% of all the lithium hydroxide in the world that goes into all the gigafactories for all electric vehicles comes from one country. It does not matter where you mine it. One country does the midstream processing.

Q38 Ruth Edwards: Which country is that?

Paul Atherley: That is China. It is the same with rare earth magnets. In fact, if we look across all the metals, nickel is lower, at around 40%, and cobalt and copper are around 60%. Between 40% and 95% of all the metals and minerals that we are talking about today, apart from palladium and a few others, go through midstream processing in China. If you wanted to weaponise, the easiest way would simply be to turn off the supply.

Q39 Chair: Given all of the international aspects to this and the collaboration we need to have with allies, which are also doing their own work around mapping their supply chains and thinking about their critical mineral strategies, I would expect the Department for International Trade to be very active in this space. Are they active enough?



Paul Lusty: Yes. The Department for International Trade is working very closely with BEIS on this topic. In the last couple of weeks, I have had discussions involving the Department for International Trade and delegations, for example, from Geoscience Australia, but also Canada, talking very much around these topics and the opportunities for international collaboration.

There was a lot of emphasis on the shared values between those countries in terms of responsible sourcing, environmental and social considerations of global raw material supply chains, and the potential opportunities for those countries and other key international partners to collaborate to develop supply chains outside China and other countries that dominate certain critical raw material supplies.

Paul Atherley: It is also the other way, Chair. Australia is reaching out to the UK. We have the Australian Trade Minister here on Monday for exactly this reason, recognising our downstream processing capability and access to the European markets, and the same with the Canadians. The Critical Minerals Association is pulling this all together and trying to join those dots, working with the Department for International Trade, BEIS and UK Export Finance. There is a lot of work being done, recognising, as embodied in the critical minerals Act, this collaboration that is required.

Chair: We have timed out for today, so thanks so much to both of you for giving evidence. We will now bring the session to an end.