HOUSE OF COMMONS

Business, Innovation and Skills Committee

Oral evidence: Extractive Industries Sector, HC 832-iv

Tuesday 6 May 2014

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Watch the meeting

Members present: Mr Adrian Bailey (Chair); Mr William Bain; Paul Blomfield; Katy Clark; Caroline Dinenage; Rebecca Harris; Ann McKechin; Mr Robin Walker; Nadhim Zahawi

Questions 314-363

Witnesses: **Dean Thornewell**, President, Joy Global (Eurasia), **Paul Burton**, Director of Service, Joy Global (Eurasia), and **Dr Patrick Foster**, Senior Lecturer in Mining Engineering, Camborne School of Mines gave evidence.

Q314 Chair: Good morning and welcome. Thank you for agreeing to address the Committee, in pursuit of our inquiry into the extractive industries. Could I ask you to introduce yourselves, for voice transcription purposes, before we start the questions?

Paul Burton: My name is Paul Burton. I am the Director of Services for Eurasia for Joy Global. Joy Global is an American mining supply company that has significant presence here in the UK based on four facilities: in Worcester, Wigan, Sunderland and Pinxton, Nottinghamshire.

Dean Thornewell: My name is Dean Thornewell. I am the President of Joy Global Mining Machinery Company. I also work alongside Paul, for Europe and Asia.

Dr Foster: I am Patrick Foster. I am a senior lecturer at Camborne School of Mines, which is part of the University of Exeter, based in Cornwall.

Chair: Thank you. Before I start the questions, I will bring in Robin to make a declaration.

Mr Walker: I have a sort of declaration of interest, in terms of Joy being a very significant employer in my constituency. I am very pleased to see you there. I apologise that I am going to have to leave early today, because I have to rush back to Worcester for a funeral.

Q315 Chair: Thank you. This is to Joy Mining. As you said, you have a significant presence in the UK and across the global industry. Can you outline the structure of your companies, where you are headquartered and what range of goods and services you supply?

Dean Thornewell: Our headquarters are based in Milwaukee, in the United States. The range of products and services that we provide are surface and underground mining equipment and consumable items. These items range from very large electric mining

shovels, used in open-cast mining environments to front wheel loaders. Then on the underground side, they range to powered roof support systems, longwall systems, continuous miners and those sorts of things. Our company has about 12,000 employees globally. Our business is structured into six different regions: Europe and Asia, China, North America, South America, Australia and South Africa. Geographically, we have six teams to run those entities.

Q316 Chair: You are listed on the New York Stock Exchange. Why there, and not London?

Dean Thornewell: It is because of the way the company is now structured—there have been a series of takeovers, mergers and acquisitions over many years. Some of them have been UK companies and some of them have been US-based companies. Fundamentally, as it was started by two American gentlemen, probably some 100 years ago, the corporation's roots have tended to lie in the US.

Q317 Chair: Is there any regulatory advantage, from your perspective, in being in New York rather than London?

Dean Thornewell: It is interesting. The way that our financials are structured, and all the rest of it, we are entities in the countries that we are in. Joy Global UK is essentially a UK entity, for statutory purposes and everything else. We are based in the countries and operate within the statutory requirements of each of those countries.

Paul Burton: When we talked about the construction of the company, it is interesting that although mining is a major growth industry globally, Joy Global today, within the bounds of the UK, is probably what is left of the entire mining supply industry, through merger and acquisition. At one time, I counted something like 23 different businesses, if you go back far enough, to the likes of Dowty, Pitcraft and Gullick. All of these world-renowned companies are joined as now one. The final acquisition was probably made in around 1997, when Joy Global—Joy Mining at the time—purchased what was left of the mining supply industry. It was quite a large acquisition at that time.

Chair: My father worked for Dowty, doing props and aircraft undercarriages.

Paul Burton: I am a Dowty apprentice, as well.

Chair: Are you? I will resist the temptation of going into our life histories. There are some other questions on this theme, but because I know Robin has to leave, I am going to bring him in with some questions on a slightly different issue first.

Q318 Mr Walker: Apart from the obvious advantages of being in Worcester, why is Joy Mining basing their Eurasia division out of the UK? As an international company, and as a company that is owned and listed in America, why was the decision made to base such an important part of your business in the UK?

Dean Thornewell: It was made predominantly because of the history of mining in the UK. For many years, there has been a very substantial mining industry. Over those many years, that has been exported around the world. From the very early days, when mechanised mining began, the expertise lay within the UK. It has remained so, exporting that to other regions of the world. The mining supply and environment in the UK is substantially different now. That could bring along a lot of discussions about skills and

going forward. Predominantly, historically, we have had the skills, resources and capabilities in the UK to export.

Q319 Mr Walker: Talking of export, what is the breakdown at the moment between domestic sales within the UK, and export, in your division?

Dean Thornewell: Specifically for the region that I am responsible for, given that we are based in the UK, about 85% of the equipment that is manufactured through our factories in the UK goes overseas.

Q320 Mr Walker: Can you break that down further, in terms of what goes overseas within Europe and what goes overseas beyond Europe?

Dean Thornewell: Because the contracts that we work on are pretty substantial, a typical longwall project could cost somewhere in the region of $60 million to $70 million. That can have a very decisive influence on your year's sales. It tends to vary, but I would say the fair majority of that, yes.

Q321 Mr Walker: What about the servicing element of the business? Is that split in the same way as the product, in terms of export and domestic?

Dean Thornewell: Service is generally 50% of our business. 50% of our revenue, year over year, tends to be service after-care and after-market activity, including the sale of consumable items, for example.

Q322 Mr Walker: Is that the same split in terms of domestic and export? Is it roughly 85% export, in terms of services, as well?

Dean Thornewell: Pretty much, yes.

Q323 Mr Walker: From the Camborne perspective, what proportion of your graduates work in the UK and what proportion go overseas?

Dr Foster: For a lot of the most recent years, the majority of students have gone overseas to work. Over the last couple of years, more have gone back into the UK. Looking here at the last graduating year, five out of 18 students who returned an employment questionnaire are working the UK, six in Australia, four in America and three in Africa. Whilst the majority do go overseas, there is still a base who do want to stay in the UK, and choose to do so.

Q324 Mr Walker: Looking forward, both of you have an interest in the position of the mining industry in the UK. Presumably you agree with Mining on Top, who said, "The UK industry benefits more widely from its position as centre of excellence for extractives." As suppliers both of skills and equipment within the sector, how would the UK losing that reputation for excellence affect your respective organisations?

Dean Thornewell: Very substantially. The reduction in the mining environment in the UK means that the School of Mines will have a reduced number of experts that come into the field, and the equipment and the engineering skills that we have based in the UK will reduce. We will not see the level of apprenticeships, or the level of students taking up

mining or engineering-related studies. We have seen that substantially, over the last five to 10 years. We will lose a lot of good engineering and good mining resources, given the reduction in the UK's mining activities generally.

Paul Burton: We have the largest geographic region for Joy Global. It stretches right over from the Eastern Seaboard of Russia, right through India and right up into Spitsbergen, up in the Arctic Circle. It is quite amazing that when you travel out there, even now, the expat community that is being recruited for those industries and foreign climes are primarily British. The age profile reflects what is happening generally in manufacturing, with people entering in their 50s, probably even early 60s. If we are not careful, we will get to that critical mass where we will not be able to supplement that quite substantial skill base. It still exists, with fresh blood coming through. The amount of expats that are still out there is amazing.

Dr Foster: From Camborne's point of view, there has been a massive contraction in the number of universities where you can study mining engineering, for example, over the last 20 years. It has gone from seven down to one. Whilst there are other institutions where you can study disciplines related to the industry, such as geology and geosciences, etc., Camborne has a historical reputation that most of its graduates have gone overseas. It has got an extremely strong brand name around the world but, having said that, the majority of our students that now come through the doors are UK students. If we lose that reputation as a centre of excellence, that will hit hard on our intake. We still get a fair few from overseas, but that would not be enough to sustain us.

Q325 Mr Walker: Do you see any rays of hope, in terms of the UK industry and UK domestic mining, for ways in which employment can be created in the long term and we can try to maintain that reputation?

Dean Thornewell: Yes. There are a few mining projects in and around the UK that will certainly have a significant impact on the future of mining. Up in the North East of England, there is a project called York Potash. Sirius Minerals is the company concerned. You may be aware they are going through their planning permission applications, etc., just now. The proposal is to mine 12 million tonnes of polyhalite a year, which is used in agricultural products such as fertilisers. If that project is successful, it is going to have a substantial impact on the UK mining environment. Also, near to Plymouth, there is a tungsten mining operation that is being established by an Australian company called Wolf Minerals.

Dr Foster: It is called Hemerdon.

Dean Thornewell: Hemerdon; that is it. That is another project that we are watching very keenly, because that has potential. The flipside, of course, is the demise of UK Coal and some of the other, smaller mining operations that exist around the UK.

Dr Foster: I was going to say exactly the same thing: they are two quite exciting projects. Down in Cornwall, there are a couple of other smaller operators looking at some smaller deposits. The ones that we mentioned are the exciting ones, for now.

Q326 Nadhim Zahawi: I am going to pick up on some of those themes. Engineering the Future told us that: "Skills development and the adequacy of mining and petroleum engineering courses at higher education institutions (HEI) are a cause for concern." What do you think, Mr Foster, would be the key recommendations that we should make to the Government to address this?

Dr Foster: Mining engineering, speaking particularly on that as a subject area, is now a very minority degree or area of study. The problem is that it has almost disappeared; that it still goes on is away from the knowledge of anyone. People are still somewhat surprised when they realise that you can still study mining engineering in the UK, with the contraction of the industry generally. It is about raising awareness of that as a subject. We can still cite very good employability rates for our graduates, which helps bring students in.

As a recommendation, it falls in as part of trying to encourage more students to come in and study STEM-related subjects in university, which has slightly increased over the last couple of years. It is also about recognising within that that mining is a valuable and exciting type of career. That is through promotion. Also, we are looking to all the companies that are in the UK, particularly based in London—so the big, major mining companies who are headquartered there, the juniors—for more support, in terms of providing scholarship opportunities and supporting lecturing staff there, so that they are putting support into institutions, like they do in other countries where they operate.

Dean Thornewell: The mining industry, per se, has pretty good technology. As you start to consider more of the energy policy for the future generally, it is very clear that in order to meet certain global targets and pressures, particularly with carbon footprints, etc., you have to start to enter into the further development of technology. If you consider ongoing investment in things such as carbon capture, that will make coal burning a more palatable energy source, again. In order to support places like the School of Mines, developing the technology in coal mining and developing the carbon capture technology will make it a higher technology environment again. Therefore, it will motivate excitement about mining and the technology that is within that. That is a key factor for having a balanced energy policy, without having energy poverty worries, going forward into the future.

Paul Burton: When you talk about mining, the mining industry, raising the profile and making it more palatable, the layman would look upon the miners' strikes, dark pits with pit ponies in there, and stuff like that. Nothing could be further from the truth. The technology involved in mining now is substantial. We have concept mines, now, and concept machines. We are even looking at seabed mining, for example, and even mining asteroids for NASA. The technology is pushing the boundaries right out there. Substantially, we have won the Queen's Award for Technology, at our company. We have won many Queen's Awards for Export Achievements.

Q327 Chair: Can I stop you, there? Did you say "concept mining"?

Paul Burton: That is concept machines, yes.

Chair: What exactly is that?

Paul Burton: Concepts are where you are exploring the possibility of mining the seabed and exploring the possibility, in conceptual terms, of how this would work. We are pushing the envelope all the time on our technology and traditional mining methods.

Dean Thornewell: Talking about technology that is around today, it may surprise you to understand that we have mining equipment now that operates without a man, on the face. We have equipment that operates with cameras. We have equipment that operates with internet connection to the surface. We are able to collect data from machines and monitor the performance. Very shortly, we will be able to make adjustments to that equipment, so we take people completely off the mining face. From a safety perspective, that is a real priority.

A recent project that we have just been involved in has sold the first low-seam longwall', to a company based in Spitsbergen, a small island in the Arctic Circle. This Norwegian company are deploying this low-seam longwall that will cut coal at a height of 1.3 to 1.5 metres, without any man involvement on the face. They will operate the equipment from each end, and it will mine 10,000 tonnes of coal per day. It is a substantial piece of equipment. It will be remotely monitored; we will be able to receive feedback of that equipment's performance in our offices in Worcester, from the mine up in the Arctic Circle, some several hundreds of miles away. There is some significant technology.

As Paul already alluded to, there is significantly more technology and investment being made in ongoing mining activity. Sadly, there is not enough.

Dr Foster: Going back to your question about recommendations, from the University's point of view, research is incredibly important. Historically, if we go back to the days of British Coal, the research base they had at Bretby was ahead of its time. A lot of expertise is still around; it may be in people who have gone into work in consultancy, but the technology is still there. We can utilise those skills, but more research funding would be useful as well.

Q328 Nadhim Zahawi: So, communication was the first thing: i.e. people choosing STEM subjects should have a better understanding of the mining opportunities. On the innovation side, Mr Thornewell, how much of that new technology in concept mining is in collaboration with universities? How does that work?

Dean Thornewell: Our new product development is done on a global scale. We do have collaborations, from time to time, with various universities and institutions. It is not what I would call an ongoing relationship whereby we meet every month or anything like that, but certainly the School of Mines has been involved in projects over the years. Some of the universities in and around Nottingham, and those sorts of areas, have been involved. We do that globally, as well. Is it robust and regimented? No, but it is called upon as and when we work through projects.

Q329 Nadhim Zahawi: That leads me nicely on to my next question. The Mining Association of the United Kingdom told us that the Government "does not have minerals extraction high on its agenda" and that it needs a "minerals strategy at the centre of an industrial strategy". Do you agree with that?

Dean Thornewell: I probably do.

Q330 Nadhim Zahawi: What does that strategy look like?

Dean Thornewell: I will also caveat that. The Mining Association is feeling battered and bruised, and has done for a number of years, because of a constant contraction in the environment in which they operate. I agree with their statement, per se, because that is how I believe they perceive things. A lot of it is linked to a balanced energy policy, and being in control of our own energy demands. That, for me, is more of a concern than a mining strategy, per se. Following the consumption of energy in the country as frequently as I do, and understanding where our energy supplies come from, what they are made up of and what we consume on a daily basis, I understand those statistics quite substantially.

My concern is more about what is going to be the energy strategy that protects, and hedges for us, our supply of energy, whether it be self-generated or purchased and imported from overseas. That is more what I worry about. Mining, in a way, is a by-product of a balanced energy policy, to a degree—or certain aspects of mining are. You need to have the right mining capabilities in place to meet the demands of the energy that you require. That is definitely part of it. That is more my concern, rather than saying that the country does not have a strategy for mining minerals.

Nadhim Zahawi: Mr Foster?

Dr Foster: If you are looking at the strategy being for mineral exploitation in the UK, then that is one thing. Ultimately, we need to have an idea of what we have got in the UK that we can exploit. There is a whole range of minerals. There are still some huge coal deposits; there are big potash deposits in the North East and lots of other smaller deposits as well. The aggregate side of things is a huge industry as well. The UK Trade and Industry have got quite a joined-up strategy in terms of promoting mining services, such as education and manufacturing, globally. That is certainly an important strategy for us, from an education point of view.

Q331 Nadhim Zahawi: You keep going back to promotion. Would you think that the answer to the question of what the Government should be doing, if anything, to ensure the UK remains a strong player in the extractive sector would combine everything from planning on the potash and long-term energy plans? Those are the sorts of areas you think the Government should be looking at, and the by-product of that would be a much stronger extractive industry. Would that be fair?

Dean Thornewell: I believe so. Driving a more self-sufficient energy supply strategy for the UK, by default, will drive a more substantial and more robust mining extractives environment. It will drive all other things that the School of Mines would certainly start to appreciate, because there would be demand for the students and engineers, etc. It would definitely start to promote that activity, for sure.

Q332 Nadhim Zahawi: I have one final question for Mr Foster, Chairman, just to help the Committee understand this a little bit better. Given the global nature of this industry, what are the key skills that you teach? Do these include how to operate the mining machinery? As a supplementary question, do your students receive any logistical training, for example how to cope with such a complex supply chain?

Dr Foster: We produce graduates in mining engineering. So, that is a normal, honours degree type of course.

Q333 Nadhim Zahawi: Do they get to play with the machinery?

Dr Foster: They do, yes. I was about to come to that. We are fortunate in having our own small mine in Cornwall, and as part of that we do let the students mine—I was going to say play—have a go, and cut their teeth, effectively, on mining equipment and to get an appreciation of what goes on. It is also a very good real laboratory for other studies, like rock mechanics and ventilation, as well. So, yes, they do, to answer that question.

In terms of the content of the course, it covers a lot of the technical and engineering aspects of mining, plus a lot of the management aspects of mining as well. A lot of issues down the supply chain are covered. For example, if you look at the management side, a vitally important part of the course is looking at safety management and sustainable development. That is an important part of the course that incorporates all the sorts of things that mining companies are now finding it vitally important to do. Coupled with that, you have the traditional subjects like rock mechanics, ventilation, etc. We do give a very good appreciation of the industry and the supply chain in our course.

Q334 Chair: I should declare a half interest here. As a graduate of Exeter University, albeit long before Camborne was involved, and currently mentoring a student from your campus—not, I may say, a mining engineering student—I have got a long interest and association with the area. We have got, shall we say, a legacy of mining education in this country, although it is only a small part of what it used to be. Am I right in saying that at one time there were something like 17 schools of mines or equivalent organisations?

Dr Foster: Possibly. Going back in my history, when I chose to study mining many years ago, I could choose from seven institutions to study at. That was back in 1998. If you go back before that, there were a couple of others, yes.

Q335 Chair: Given the fact that we have got this legacy of high-quality, mining engineering education but a much reduced extractive industry, do you think you can develop a potential world leadership role in terms of mining education, notwithstanding a lack of an extractive industry in this country?

Dr Foster: Very much so, yes. We are involved in a number of such leadership projects now, working with both mining companies and countries. We are heavily involved in Zambia with a big Government initiative looking at skills and development for the Zambian mining industry. We are also starting some similar project work in Malaysia, with one of the big tin mining regions. That is a recent initiative. We are still working; that is two of many. We also have similar projects in Finland and in Kazakhstan as well. We are away from just the bona fide teaching of mining engineering and geology to students. We are working with governments, countries and big mining companies, in very much a leadership role, helping them develop their capability for skills in-house.

Q336 Chair: What proportion of your student intake is international? Do you think there is potential for developing it?

Dr Foster: The percentage of international students is relatively small at undergraduate level. It is bigger at postgraduate level, such as on master's courses. I can get you some statistics on that; I have not got them to hand. Certainly, at master's level, probably up to

about one-quarter of students are from overseas. At undergraduate level, we have students from outside Europe. We have students from Spain, Poland and Ireland, but we also have students from Botswana. That has been a nice source of students for us in recent years. The name and reputation of Camborne School of Mines is still very high in the global industry, and that helps recruit students. Yes, I think we could do a whole lot more with that.

Chair: If you could send any additional evidence, that would be very helpful indeed.

Q337 Ann McKechin: I turn to the international perspective of the industry. Where do you think the growth areas currently are in extractives? Which areas are declining? We talked about the UK's position, but I would be interested to hear your perspective on other countries in Europe, for example.

Dean Thornewell: I will talk specifically about the region that we are responsible for, and then move on to the wider picture of Joy Global's operations. Poland has a very substantial surface and underground mining activity: somewhere between 160 million to 200 million tonnes of coal a year, with targets to grow. Germany also has very substantial mining activities. One of the regions Mr Foster just mentioned is Kazakhstan. I have visited Kazakhstan just recently myself. I was visiting many customers, because of the substantial prospect of growth in Kazakhstan.

You cannot afford to rule out Russia, by any stretch of the imagination, despite the current difficulties that are perceived. Russia has very substantial mineral beds of many, many minerals, all around the country, ranging from diamonds and gold to lots of coal, iron ore, etc. Despite the current challenges with Russia, that is an area of significant growth. Once the elections are concluded in India, I suspect that that will start to loosen some of the bureaucracy that we have suffered for the tenure of the last Government there, and a little before. I am very hopeful of India. India has a substantial demand for coal, which is far beyond what they can produce themselves.

Going a little further afield, the United States has been an area that has been very dependent on coal, particularly in north America. The advent of fracking and the shale gas activity has reduced their demand for coal. However, natural gas, or shale gas, has been a real success for them. Generally in China and more around Asia, there are some significant growth activities still forecast. Places like Vietnam are up and coming areas for certain types of mineral extraction. There are a number of countries that have taken some time to catch up, if I can say that, but are now purchasing some of the latest mining technology.

Q338 Ann McKechin: Is it only the UK that is substantially declining?

Dean Thornewell: No.

Ann McKechin: Are there other countries that are in a similar position?

Dean Thornewell: I will talk about coal specifically, for a moment. Generally, mining and coal extraction has been much reduced in the last two or three years. It is only in the last quarter that we are starting to get anywhere close to the numbers of two or three years ago. That has definitely been the case around the world, and everybody has felt that. There has still been very good production of things like gold and copper, all over places like South America, despite the price of gold being $1,600 per ounce instead of it being

significantly higher. Coal has obviously been the exception. The influx of shale gas has reduced coal, pretty much around the world. In terms of areas of decline, the UK is, sadly, probably the most prominent of the more influential countries in and around Europe that has less capability.

Q339 Ann McKechin: We took evidence from Glencore, which is registered here in the UK but most of its operations are outwith Europe. They told us that the extractive industry was both global and mobile. How much of a risk is there that mining companies may move from the United Kingdom? Why do you suppose they might want to? You are saying, for example, that countries such as Kazakhstan or India are becoming more sophisticated in their mining technique. Is it then only a matter of time before they start to begin the industrial production of equipment and resources, in terms of education and academic courses, which will then meet the type of industry that they are now growing?

Dean Thornewell: If you take Glencore, Rio Tinto and Anglo American and those sorts of organisations, because they are global companies, it makes sense for them to have their offices somewhere roughly in the time zone in which they operate. You can walk down to Berkley Square and go and visit the offices of a couple of these large corporations. Fundamentally, you will not move away from the corporate offices being somewhere in or around this side of Western Europe.

They talk about the transient nature of it, because the manufacturing of equipment, as well, is definitely migrating to lower cost manufacturing countries. Corporations will follow the latest find and prospecting activities. Mongolia is now a typical area where Rio Tinto and Glencore Xstrata, etc., are looking to set up operations, because that is the next big thing. In terms of keeping skills, what is important is making sure your intellectual property is not that transportable. Some of the companies are doing this, and some of them are not. So, it is making sure you keep your engineering activities, design, research and development in places like the UK or the United States, and tending to look for your manufacturing to be at lower cost. That is what we see, quite substantially. Our own company is engaged in some overseas assembly and manufacturing.

Q340 Ann McKechin: You say that will be a growing trend, not only for your own company but for others in the industry.

Dean Thornewell: There is a trend of following where you can obtain the more efficient manpower rates, in a lot of heavy engineering companies but not just in the mining sector.

Q341 Paul Blomfield: I wonder if I could explore in a little more detail, with Dr Foster, the educational opportunities. We have covered some of this ground, but perhaps we could start off by understanding how your school is funded. It has obviously been incorporated into Exeter for just over 20 years. Is it funded using a conventional higher education model?

Dr Foster: For all intents and purposes, it is a department, in university terms, of the University of Exeter. It is funded as any other University department is funded; that is, on the basis of student fees and fee income, which makes up the majority of the income. Coupled with that, you have got income from research, and also additional income that comes in from other sources, such as the initiatives that I mentioned, support from

companies and initiatives working with overseas institutions. However, the bulk of income is student fees.

Q342 Paul Blomfield: There are no different relationships with industry or industry funding because of the history of the School.

Dr Foster: We have two funded Chairs, who are Professors of Mining. Other universities around the country have research centres, funded by mining companies. For example, both Nottingham and Imperial College have Rio Tinto-funded research centres, both looking at aspects of mineral processing. The University of Derby also has a diploma level and, now, an honours degree course, focusing on the aggregate sector; that has heavy industrial support as well. In terms of us, as I say, it is fee income.

Dean Thornewell: What tends to happen is a company like ours may commission a study, from time to time. One example is that we used Derby University, or Nottingham University, to do a study for us of some mining operations up in the North East of England. There was some payment made for that. I am pretty sure that, whilst it is not a huge amount by any stretch, there are some other organisations that do similar things. I do not know if you would be aware of that.

Dr Foster: Yes. There are also little bits of contract research. In terms of involvement of industry, we not only provide students at the end with a degree, but students also work with companies during their degree courses, for example doing vacation work and during their master's projects, etc. We try to encourage students to work in the industry at that time. In fact, it is mandatory for our undergraduate mining engineers to spend the vacation period of their second year working in a mining operation somewhere. We have always managed to do that. It is a bit harder this year, but two years ago we had students in 11 different countries at that point in time.

Q343 Paul Blomfield: That is interesting. On the issue of research, I wonder what opportunities there are for further developing business collaboration. I represent Sheffield, where our academic strength is in engineering. The partnership that the University of Sheffield has with Boeing and Rolls-Royce in the Advanced Manufacturing Research Centre is doing some fairly groundbreaking research on an ongoing basis. Rather than project funding on specific issues, it is a long-term, collaborative relationship, which is making some significant breakthroughs. I wonder if there is the same opportunity in mining.

Dr Foster: There are certainly opportunities. One of our Chairs has been funded by Rio Tinto for 11 or 12 years, and has a relationship in that way. We have not got anything in the line of Nottingham or Imperial's heavily funded research centres. We have not got that, but there is always the opportunity. We still do excellent research. There is potential for us and we have just got to exploit it better, through corporate partnerships. That is one way we are looking at, in the short term.

Q344 Paul Blomfield: Where else is that happening around the world? You talked about Imperial and Nottingham as centres of excellence in the UK. With the decline in mining activity in the UK, has the academic focus shifted to other places around the world?

Dr Foster: In terms of research?

Q345 Paul Blomfield: We are talking about research now, but I was going come on to teaching in a moment. So, cover both.

Dr Foster: It has been well publicised. In the early 2000s, there was a contraction in the number of universities around the world that offer mining engineering courses. That is not just in the UK but in some pretty heavy-hitting mining countries as well. If you look at Australia, the universities have consolidated into four universities: the University of Adelaide, the University of New South Wales, the University of Queensland and the Western Australian School of Mines. They all work together in having common teaching material. As I understand it, what they find is that the students do not tend to go from one state to the next to study. They have an almost home state market, so they have a common teaching material across their courses. That helps. Some mining companies have sponsored big research centres in New South Wales and Queensland as well. The industry has been extremely booming in Australia in recent years, so you would expect a lot of that.

In terms of the question about local markets, ultimately, mining companies will always want to take on students from countries in which they have operations. That is an opportunity for us, in terms of helping establish mining universities, mining courses and mining infrastructures and education around the world, as we are doing. That is where the opportunity lies for us.

Q346 Paul Blomfield: I was interested to hear that you have a relatively small number of international students. If I heard you right, you described some of your courses as being dependent on the shrinking UK student base, and if that were much smaller, the courses would potentially tip over. If I look at some of our engineering courses in Sheffield, it is absolutely the reverse. Those PGT courses depend on international students, and without them, they tip over. That would be a real problem for us. Why is mining so different? Given your enormous international reputation, why are you not getting those large numbers of students? You mentioned a number of countries where they were coming from, but you did not include China.

Dr Foster: No, we have no intake at all from China. In the last couple of years, the majority of overseas students who have come into Camborne have been from Africa, Sub-Saharan Africa in particular. As I said earlier, that is higher at the master's level. I will provide a breakdown of statistics. It is small. It is not so small it is insignificant, but it is a smaller percentage than people assume. People assume that Camborne is reliant on overseas and has a lot of overseas students. We had a huge intake a couple of years ago from Botswana; about 11 mining engineers came, and a similar number of students went up to Leeds University, to do mineral processing. That number was quite high. It has dwindled off as that group of supported students has come through from their company. We do need to work on our international links, to increase that. There is a lot more demand at the master's level, certainly, but we could do a lot more at undergraduate level as well.

Q347 Paul Blomfield: Where are Chinese students going to study mining?

Paul Burton: A lot go to Chinese universities. Within our own organisation, in Russia, India and China, we populate it with a lot of graduates that are educated locally. There are a lot of regulatory issues that we need to understand, as well as knowledge of the local

business. When you go to the China facility, for example, it is populated by quite a few young graduates and they are mostly locally educated, from within our own organisation.

Dr Foster: China has its own University of Mining and Technology, for example, in Beijing. I am sure that Chinese students do take the opportunity to go abroad as well. As to where they tend to go, I must admit that I do not know, at the moment. I can look into that.

Q348 Paul Blomfield: It is interesting. Although in engineering, business and everything else, there are Chinese universities of growing status, still the brightest and best Chinese students choose to study in the UK or the States. It just seems that there is an opportunity there somewhere.

Dr Foster: Noted, yes.

Q349 Mr Bain: There is great concern, both domestically and in organisations like the OECD, about the UK's skills base. Could I put to you a couple of comments, and see whether you agree with the first or the second? The first is from Sirius Minerals, and they have told us: "It is well known within the extractives sector there is a national and global shortage of people with the skills required." The other comment I would put to you is that from Interior RMG, who have stated that "there is still a good-enough skills base". Which of those comments would best represent how you see the situation in your sector?

Dean Thornewell: It is quite interesting. I will start with a statistic. The average age of people who have worked as field engineers for companies like ours is 54 years old. The average age of people who have worked in coal mines is a little less than that, looking at some of the UK coal mines. Then you couple that with the comments that Dr Foster made, about the number of graduates and the levels of throughput of students, and it is very clear that there is a substantial gap.

I am picking up on the point Sirius Minerals have made specifically, because their mining operation will employ somewhere between 300 and 400 people, in a part of the country where there is also a potash and salt mine. Specifically to them and their geography, there is a specific issue. Beyond that, with the forecast closure of the UK coal mines, there will be very little resources to operate in any mine. Should any mine open up somewhere around the country, there will be a challenge to resource it. I do believe that there is a substantial gap, in terms of resources, to operate mines. There is also a substantial gap in resources to operate mines to give the mines some longevity—in other words, being able to recruit mining staff at an age profile that will give that mine some future, rather than recruiting people who may be towards the end of their career.

I think there is definitely an air gap in the system, which over the next three to five years will be a significant challenge. If we were in a position as a country to begin to grow the extractive sector, we will be very hard pressed to find the mining resources, the leadership and also the substantially qualified individuals to be involved in that, such as the geologists and whatever else you have. That answers the first piece.

Paul Burton: It is a really good question. Recently I was in Saskatoon, looking at a management company there with a similar mineral extraction challenge as Sirius Minerals: a large potash mine called the Jansen Project. They base their office in Saskatoon. On the

aeroplane, there were a lot of free newspapers; I had a quick look at them. It was amazing to see the mail shots and the advertisements from Australian mining companies looking to poach mining expertise from the Saskatoon and larger Saskatchewan area. This is a global phenomenon; it is not just for this country.

Mining is going to be a major global growth business. We have just been talking about India, China and Russia—if, hopefully, God willing, this problem sorts itself out. There is going to be a demand for expertise. I spoke earlier about how wherever I go in the world, there is expat labour there from the UK, albeit the age profile that Dean has just described. That is a very good question. If we are not careful, we will get to a critical mass level where we will have the demand but not the time to put something in place.

Dr Foster: In terms of the second comment about there being a good-enough skills base, the mining industry has effectively boomed over the last couple of years. There has been a lot of increased activity, as commodity prices have increased. So, over the period of maybe 2006 to 2009, if I look at our students who graduated from Camborne, it was a students' market. They had four or five job offers from all around the world that they could go to. That tells you that there obviously is not a skills shortage when the industry is booming. Things have been quieter in the last couple of years. We see that in terms of getting the students out now; it is a bit harder for them. They are not going to get three or four job offers each; it is a lot harder.

The key is in the comment that was made about the age profile. Certainly, that is an issue all around the world. As the industry picks up again, the demand for students will appear again. We lag almost three years behind, because of the three-year time gap from when you start a degree to when you finish it. When the industry does well, there is a huge demand for students, not just from the UK but from other places that mine. That is at graduate level.

Q350 Mr Bain:: That is a very interesting point. What I take from that is it is not just about the supply of skills; it is also about demand for them, as well. That leads us back to the central position, which is that the Government has a big role to play in having an overall strategy for the industry, and in trying to boost the industry and the ability of institutions like yours to offer courses for the next generation of people in the extractive sector, potentially from across the world. What more could it do to make Britain a world leader in skills in the extractive industry?

Dean Thornewell: You have got to have an extractive industry that is growing, and creating that demand. Whether you are mining potash, polyhalite, gold, diamonds, coal or any of those minerals, then the more of them you take out of the ground, the higher the demand for labour, technology and equipment, which will then drive higher demand for engineering, design, etc. The Government's priority perhaps ought to focus on creating the demand, because once that demand is there, all of the things to support that demand will develop. It will require investment from companies like ours, companies like the mining houses, etc., around the world, but I see the Government's priority as very much to create the demand. The energy policy drives that as well, in terms of having an energy policy that has a mechanism for using and digesting the resources that come out of the ground. That is a critical point as well. I am pretty sure that most people around the table would recognise that.

Paul Burton: Also making it attractive for the prospective student. If you just arbitrarily went on the street and asked, "Would you like to go into mining?" the answer would probably be "no", because it is not fashionable and its perception is pretty bleak. Whereas in technology terms, and the potential for advancement in that respect, as I said earlier, it is very high and very interesting and quite a state-of-the-art type of business. We have been in a few schools and I remember challenging the kids in some of the classes I have been in: "Everything is mined or grown; there is no exception." We could encourage the Government to publicise that fact: that this industry is quite trendy as well.

Dr Foster: I think there are two issues in terms of maintaining its place as a world leader in skills development. There is obviously what we have been talking about here, the indigenous UK base. My main worry there is if, for example, we were to exploit the coal reserves we have in the future, where would that expertise have gone? That is a huge worry and I would be worried about that.

Also, from a global point of view, I have come across people saying, "Why should people come to Camborne?" or "Why should we use British mining engineers or consultants?" because we have not got a mining industry as such. That is very much a minority view. We still have a lot of expertise here, and that is known around the world, not just in services, technical services support, education, etc., but also in manufacturing. I just think we need to exploit those a lot more. It is encouraging to see that UKTI do realise that. I am sure you are aware of this publication last year done by UKTI as a prospectus for the industry. That is a good thing. That and support behind that should be encouraged because that benefits certainly everyone around this table here: the skills development, manufacturing base and other technical services. That is where we can really make a big impact.

Q351 Mr Bain: It is fair to say a stronger domestic extractive industry would be beneficial in growing the engineering skills base that we have got here. A question associated with that is: is it an increasing struggle to actually hire skilled labour in the sector or is this simply a problem that is restricted solely to the mining companies?

Paul Burton: If you take our Sunderland factory, for example, that employs just over 200 people. It is everything this country needs: we design, we manufacture, we employ people, we have a wide supply base. We sometimes struggle to get a fitter or an electrician there. Sometimes we struggle a little with recruiting electrical technicians on the manufacturing side. Service engineers are another one, for example; people who not only have those skills, so it is not just a question of recruiting an ex-mining person, but who is going to be technically competent with the type of high-tech equipment that we produce. We have had issues there. We are governed to a certain extent by what is happening indigenously with our own industry, because that is what we are responsible for in this country. Where we can, however, we have employed apprentices—we have apprentices coming through—and so we are doing what we can in that way. However, when we do go out into the market place to attract someone we really want—in their mid-thirties with a nice mortgage and all that sort of stuff—to come and work for us, we do struggle sometimes for those skills.

Dean Thornewell: The other point to add as well is that mining per se is obviously an activity that is very safety oriented. There is a significant amount, and rightly so, of

regulation and certification that needs to be achieved before you can deploy somebody into a mine. Safety is a significant priority. We have a Mines Inspectorate, and we have a small number of people who are qualified to deliver this training, certification approval and so on and so forth. You may find engineers out in industry who are prepared to take responsibilities and go and work in mining environments, but then getting them qualified, certified and that sort of stuff is also a challenge. Hearing from Dr Foster about parts of the education and the courses that the students go through, they include quite a substantial amount of safety training, as you would expect. There is still a certification period and certification to be achieved before people can be deployed underground or to operate the types of machinery. There is definitely a bottleneck. It is a necessary bottleneck but something that requires more capacity as well.

Q352 Mr Bain: We have heard about the age profile of the workforce in the extractives sector. Can we perhaps look at the issue of gender now? Engineering the Future have written to us to say, "There is a disappointingly low proportion of women in HEI engineering courses at graduate and postgraduate level. This is increasingly a competitive disadvantage." Have they got a point?

Dean Thornewell: I do not know whether Dr Foster wants to comment about the profile of the students.

Dr Foster: Yes, admittedly. Again, I look at the mining engineering course at Camborne. For example, in our intake this year we took in 40 students and 10% of those are female. If you do the maths, it was four. It is a very small number. If I look at the percentages—I have got the stats here for the last seven years—in our second year, the intake last year, it was 16% out of an intake of 37, so that I suppose was the peak. It is small numbers from that point of view. If I look at our course in geology, the percentage is higher, but it is still heavily weighted towards men.

Dean Thornewell: The profile of people in mining operations per se, whilst I could not recall a specific percentage to my head, is very male orientated. That is both operationally at the mine face and within the senior management groups of the various corporations that I interact with.

Paul Burton: Just in the UK in our own organisation, I have just been trying to count the lady engineers, and I can only think of one, unfortunately. She is a Polish graduate. I have a lot of female colleagues in other functions, quite senior positions in finance and what have you, but on the engineering side I think your questions are pretty valid. I can only think of one female engineer.

Q353 Mr Bain: Have you been speaking to both BIS and the Government Equalities Office about what more you can do to market the extractive sector as a very valuable source of employment to women and to overcome what you have described as a fairly awful record, in terms of women's involvement in the industry?

Dr Foster: We are involved in the Women in Mining body that has been set up in London. We have our branch down there and we are heavily involved in those activities. Yes, it is something that we do try to promote. We run taster courses for mining for sixth-form students. If I look at the last couple of those, there have been quite high percentages of

females in those, but in terms of the conversion rate into coming through the doors to study it, it is, as you say, very depressing. We need to do a whole lot more on that.

Q354 Mr Bain: Have you any final comments on how the Government could help in terms of this? If you are saying it is an issue that has got to be addressed at school level, then it is even the Department for Education that needs to be engaging with you to ensure that this particular industry has been marketed as a good source of skills and skilled labour for the future for young women.

Dr Foster: There are some role models out there. Women in Mining has recently published a document outlining role models throughout the world and leaders in the industry. There is a fair number from the UK in that, but point taken.

Mr Bain: More needs to be done.

Dr Foster: I will have to go back and think about it. If I may, I will reply to you afterwards.

Q355 Rebecca Harris: Before I start talking about safety questions, I would just like to put on the record that I think my own household is going to contribute enormously to, if not the gender balance in mining, the age profile. Judging on how much time my son, seven, spends playing Minecraft, he should be at postgraduate level already. In relation to the safety issues, we heard when members of the Committee visited South Africa examples of how some supplying companies perhaps should be encouraging better safety standards around the world. An example was given by the Bench Marks Foundation, which told the Committee that one company had agreed to supply trucks without dust filters because the mining company they were supplying simply did not want to replace them when they were worn out. I just wondered what your views are on this and if this sort of pressure is something you have experienced or witnessed.

Dean Thornewell: I will just answer that. The type of practice that you just outlined is few and far between, generally, from our experience of the mining community. Safety generally, through the majority of the senior organisations, mining companies, is their number one priority. Many of the corporations talk about "zero harm" and "striving for zero harm". Our organisation, as an equipment supplier, is no exception. We work very hard with our customers to design technology that takes people out of harm's way. I mentioned earlier, in answering a previous question, about a longwall system that can now be operated without a man on the face. That has been motivated by safety and a drive to improve safety.

At the local level in mines, of course policing is a substantial challenge. Our customers do ask us to help them with mechanisms for policing and continually removing people out of harm's way. Things like proximity detection have been introduced. This detects the position of people who may be operating the machine and cuts it off, that sort of thing. That is a piece of technology that is relatively new. The longwall I have already talked about. Generally, most equipment suppliers and most reputable mining houses, I will call them, see safety as their number one priority.

Q356 Rebecca Harris: There are others that perhaps do not. Have you ever actually yourselves turned down a contract because you were concerned about the mining company's attitude to safety?

Dean Thornewell: I cannot think that we have actually turned a contract down. What I can tell you is that, when customers have approached us with a specific piece of business, or a project, we have insisted on incorporating certain aspects into the specification of the equipment to ensure certain obligations are met, from a safety perspective. We play a more proactive role in informing and assisting the customer, and steering them to improve their safety performance.

Paul Burton: The level of sophistication of our equipment by default would eliminate that type of customer, anyway. Like Dean said, in relation to our selection criteria for bidding or not, the customer would want our equipment that has a certain level of sophistication ingrained into it anyway. With safety being its paramount features, they would be inherent in that design. If we are competing with somebody not providing that equipment, we probably would not win it anyway, on price. It would be a lot cheaper.

Q357 Rebecca Harris: Right. Are there reputational risks for you as well in this?

Dean Thornewell: Absolutely. In the same way our customers take safety very seriously, we do as well. I will give you an example of how seriously Joy Global, as a company, takes safety: we start every meeting with a conversation about safety. At every board meeting that the company has, the first thing that you present is the statistics for safety. One of the three imperatives of our entire company is zero harm. That is the number one out of the three things that are important. We portray that safety profile globally and to all of our customers as well.

Paul Burton: Also our supply chain—we integrate it into our customers and our supply chain, and obviously our in-house manufacturing as well. We investigate every safety escape. If it is a near miss, we investigate it like it is an accident and we put a corrective measure in place. I do not like to crow about it, because I am superstitious as well about events, but we do have quite a good safety record.

Q358 Rebecca Harris: Do you think controversies in the extraction industries, like mining disasters and illegal behaviour, have a knock-on effect on your reputation?

Dean Thornewell: People can definitely connect them. In the unfortunate event that these things do happen—mining disasters happen periodically—it is very important to understand and investigate the root causes of those situations. Quite often, as awful as it sounds, the root cause tends to be a set of circumstances where something or somebody is working outside of a designated process or a designed process or the way that they have been educated. You tend to find people taking shortcuts, doing things they should not, or working in areas where the roof is not safe and it has not been bolted—those sorts of things. Promoting the safety message and removing people from the mining process needs to continue in order to improve that safety record.

Q359 Rebecca Harris: You were very clear earlier on: you said the whole industry is safety driven, safety oriented. However, it is not public perception. We have had issues over potential fracking and the Balcombe protests. There is a strong feeling, certainly in this

country, and a suspicion, that profits will be put before safety and that the safety regime is not particularly transparent. What are your views on, in particular, the domestic safety regime and the transparency of that for the public to give public confidence?

Dean Thornewell: Yes. The nature of mining is such that it is not, generally, openly promoted. We have heard the discussions today; you do not see television advertisements to say, "Mining is popular and it is the new thing." Due to that, the good work that is being done in mining is also not promoted. People have what I would call pretty old Polaroid pictures of what mining used to be. If the opportunity existed to get those Polaroids updated to new digital photographs, then people would have a very different perception about the mining environment. We talked about technology and such earlier. It goes back to creating the demand that I talked about earlier. Until mining is a broader topic that is more advertised and promoted, and there is a bigger demand for it, then people will still have those old Polaroids that they will walk around with. Promoting mining per se and the technology associated with it will change the perception of mining generally.

Q360 Rebecca Harris: Is there anything more we could do to give public confidence in the environmental and safety protections of it?

Paul Burton: There is a double-pronged approach here, because sometimes the people that have these concerns or perceptions also feel that perhaps mining can be shelved. They probably do not fully understand or comprehend that mining is a necessity. Fundamentally, as I said before, in schools, everything is mined or grown; there is no exception. The question is how we do that in the most environmentally friendly and controlled way. Until somebody develops the other nuclear four that we have not got, this is what we have got. We need fertilisers, we need precious metals, we need copper and we need coal. Although we have just been talking about its demise in the UK, coal still generates over 40% of our power demands. Somehow we need to educate the people that have this perception in the fact that mining is a necessity. That is one part of it.

Then fracking, for example, is the new rock and roll going around at the moment. If somebody was going to frack on my doorstep, I think I would be out there with the placard, because it is an unknown and there are all these sorts of things going on. In addition, how it has been reported is quite negative. The type of mineral extraction we are talking about obviously is not fracking, and probably making that demarcation between the two is quite important.

Dr Foster: On the subject of safety, in terms of new people entering the industry from graduates, we—I think I mentioned this earlier—do a major part of our course on safety and sustainable development, so we do a lot of teaching. We are also involved in doing some quite high-level manager training in safety with three of the big mining companies. We promote a lot of that. It is pleasing to see, when I see students who come back for reunion dinners or whatever, that they say that, if they have learnt nothing else, the safety knowledge they have got from their studies has really helped them in the big wide world. That is quite pleasing, so I thought I would mention that.

Q361 Caroline Dinenage: I am going to lead on from the same subject. Dr Foster, if I could just ask you to expand a little bit more. When the Committee were in South Africa,

they heard a lot about growing concerns over the environment, in particular the sustainable use of resources such as water. I would just like to hear a bit more about how you teach and what you teach the next generation of miners about responsible mining and sustainable extracting, and how much of your course is dedicated to this.

Dr Foster: Certainly. We have a third-year module in the undergraduate course on safety and sustainable development. It was two separate topics: safety management and environmental management. We found they had a natural fit together so we bolted them together into one big teaching module. It is split half, half. In terms of, for example, safety, it is not about personal safety, although that is an issue; it is more about the things that they need to know as managers of the future, with respect to safety management. So, how to implement safety management systems, how to risk assess, the difference between looking at managing occupational risks and major hazards, the falls of ground, fires, explosions. So there is that distinction as well.

In terms of the environmental side, the course covers a huge area. We cover a number of things in that: obviously, bread-and-butter environmental management, so environmental management systems, EIA, scoping studies, etc. We also talk about some of the big global initiatives such as the global finance standards in terms of their requirements because that drives a lot of mining companies; if they have to raise money and raise capital, they actually have to comply with these global standards. We look at all those reporting systems. We have focussed lectures on particular environmental aspects of mining: dust, noise, etc., plus also mine closure, aspects of community in relation to management as well. There is a whole range of things. I can send you the syllabus, if that is of interest to you.

Q362 Caroline Dinenage: Is that level of education fairly standard across the industry?

Dr Foster: I cannot really say in terms of the industry, but it is certainly in terms of what we teach. It is representative of the industry, yes, in terms of it is what happens. Yes, it is up to date.

Q363 Caroline Dinenage: It is something that tends to happen. Then to all of you, leading on from that, what do you think are the biggest current environmental concerns? Also, how do you expect that to change in the future? The water issue was really something that had immediately sprung to mind to us as being a huge cause for concern, and it came out of the trip.

Dr Foster: One of the big environmental concerns is climate change. Obviously there is an effect of mining on climate change and the effect of climate change on mining. If we look at the effect of climate change on mining, I think that is a huge issue. Many mines operate in very remote parts of the world, and only in recent years have companies woken up to the fact that if they have got a 30-year life of a mine here in this remote location, what is the climate going to be like in 30 years' time? They cannot rely on the fact they have had it till now. That is a huge issue.

Dean Thornewell: We touched on it earlier: obviously carbon footprints and the significant reductions that are required there. Investment in cleaner coals, carbon capture and storage, those sorts of things, is definitely something. One very nice example of how

things have been done properly and managing the environmental impacts is the proposals for the polyhalite mine, York Potash, which we talked about earlier. That is under the national park up in that area. The priority has been, all the way through that project, not to change the landscape or significantly affect anything. The whole mine and the whole mine operation has been designed with the national park in mind. There are some good stories around all of this. Regarding the carbon footprint for the UK and the carbon capture situation, I would probably put cleaner coal up there as the second one after the safety aspects, to be perfectly honest.

Paul Burton: The demarcation between fracking and what we are talking about, mining—and this is probably a little bit controversial—is do we need to look at the way the power generating companies operate? It is a little bit heretical, but for the operators in the private sector, the question is does demand for energy outweigh that in the sense that we need to keep the lights on? If Mr Putin turns the gas off through the Ukraine, what will it do to us? Should we be looking at things and a bit more focussed on carbon? If we try to make a new power station with carbon capture, there is obviously a cost to that. Probably the generating companies would not readily invest in that without some sort of subsidy or a different type of model to allow that to happen. We were with Robin and we met Ken Clarke, for example, at a fundraising dinner in Worcester. Ken Clarke was talking about coal being a fuel of the future and I thought, "How strange." He is probably right; coal is probably a fuel of the future. Nonetheless, it is a big risk to say that we sit on 300 years of coal reserves in this country. We are quite at risk of things happening from outside forces.

Chair: If there are no more questions, that concludes our questioning. Can I thank you? That was incredibly helpful. As ever, when I conclude a session, I do brief you: if there is any question you feel that we should have asked but did not and you would like to answer, please feel free to send it in further supplementary evidence to us. Similarly of course we may look back over the transcript and think there were one or two questions we should have followed up but did not, and we will write to you and would be grateful for any further information that you can give us. You have undertaken to give us some more information on occasion; we would be very grateful to receive that. Thank you very much. It is very helpful indeed.