HOUSE OF COMMONS

Science and Technology Committee

Oral evidence: The role of technology, research and innovation in the COVID-19 recovery, HC 95

Thursday 25 November 2021, Coventry

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Watch the meeting

Members present: Greg Clark (Chair); Aaron Bell; Rebecca Long Bailey; Carol Monaghan; Zarah Sultana.

Questions 146 – 230

Witnesses

I: Andy Street CBE, Mayor, West Midlands Combined Authority; Dr Clive Hickman, Chief Executive, The Manufacturing Technology Centre; and Professor Simon Collinson, Director, City-REDI, University of Birmingham.

II: Tony Kinsella, Chief Executive, Lucideon; and Stephen Malone, Group CEO, Malone Group.

III: Professor Martin Freer, Director, Energy Research Accelerator; and Professor Daniel Smith, Executive Director, Global Cell and Gene Therapy Portfolio, Cobra Biologics.

Examination of witnesses

Witnesses: Andy Street, Dr Clive Hickman and Professor Simon Collinson.

Q146 **Chair:** The Committee is now in session. The Science and Technology Committee is meeting in the West Midlands today at the Manufacturing Technology Centre to consider the particular role, strengths and opportunities that the West Midlands has in helping us recover from Covid. We have witnesses from the region and we are very pleased to be the guest of the Manufacturing Technology Centre. Dr Clive Hickman, as chief executive, is one of our witnesses this morning.

I would like to start formally by declaring a non-financial interest, since we are in the West Midlands, that I chair an informal group, Friends of the Warwick Manufacturing Group at the University of Warwick, which is voluntary and unremunerated. No other member has notified me of any other interest to declare, in which case we can proceed with our first panel of witnesses.

We are very pleased to welcome Andy Street, who is the Mayor of the West Midlands—thank you very much indeed for coming, Andy; Dr Clive Hickman, who is the chief executive of the Manufacturing Technology Centre, and we are grateful for the tour of the magnificent facility and the opportunity to meet your colleagues here and to learn about the work that you do; and Professor Simon Collinson, who is director of the City-Region Economic Development Institute at the University of Birmingham. Thank you very much indeed for coming.

I will turn first to Zarah Sultana, since it was Zarah's suggestion that we come to the MTC, to perhaps give a bit of context as to why she suggested we come here.

Zarah Sultana: Since joining the Science and Technology Select Committee, one of the things that we are all very passionate about is going into our regions and looking at the companies that are doing the work on the ground, talking to those world-leaders in their fields. I had visited MTC only a couple of weeks ago, so I was very proud to propose having our fact-finding on the ground visit here. It has been an absolute pleasure. I have seen things that I didn't see on the previous tour, so I am just incredibly grateful to Dr Hickman's team for facilitating this, and hopefully we will be back in Coventry again very soon for another session.

Q147 **Chair:** Very good. Thank you very much indeed, Zarah. Let's kick off. Perhaps I can turn to the Mayor first to summarise what you see as the opportunities that arise from science and technology in the West Midlands in the years ahead and what we need to do collectively to make sure we avail ourselves of those opportunities.

Andy Street: Yes, thank you very much, Mr Chair. First of all, thank you for coming to the West Midlands to do this piece of the inquiry, I think is the correct word for it. I want to say two things by way of introduction.

The first of course is that you are coming to a region that has some incredible strengths, and the second is that we are not doing well enough at drawing in public funding to support those strengths, if I can say that. The starting point is probably to say, though, that this region has for a number of years now focused on an economic plan. We called it, under your time in BEIS, our local industrial strategy, and we very much tried to concentrate R&D activities under the sectors that were leading that strategy. What we are famous for—and it was indeed the leading cluster in the work we did to research the local industrial strategy—is of course the automotive sector.

We do have some incredible institutional strengths: the Manufacturing Technology Centre, the Warwick Manufacturing Group and all of the individual businesses that invest. We will come on to see the results of that in a moment. We are also diversifying our economy and we are doing a current piece of work on how we recover from the pandemic, which we call our plan for growth, and we are looking at the other clusters where we believe we will lead in the future.

The electrification of the automotive sector is absolutely critical and there is a whole piece about how businesses transition there. We also have strengths in logistics and distribution, in the medtech and healthtech sector, and our biggest employer in the region is the professional services sector. We are seeing technology change how that operates as well. Critically, the fastest-growing sector for us is the green manufacturing sector—the whole challenge around net zero. We believe we have a real strength to play there that we might explore a little later on.

If you look at what is being invested behind R&D in the region, the simple chart that I have put around shows a very unusual position, I think. What this chart does—and Nesta has produced recent data—is show for each region of the country the investment that is coming from business; the private sector investment is on the left-hand axis, and on the bottom axis is the public sector investment. You will see that in terms of private business investment we are in a very good position, behind only the east of England and the south-east, and that of course is very much dominated by the Cambridge area of the east of England, and performance in their sectors.

Our industrial sectors are what lead that good performance. We are very concentrated in a relatively small number of industrial sectors, which is arguably a strength, because it means the quality is very good, but it is arguably a weakness in that we do not have the diversified economy that we might like to get to.

The most telling thing is despite private sector businesses pouring in investment into R&D, we are the lowest-performing region in the country in terms of the public sector contribution to R&D. If you did a ratio between the two, we have the greatest ratio of anywhere in the country: £4 of private investment for £1 of public investment.

The question I would encourage the Committee to think about is why public funding is not getting behind the clear decisions of private investors. We are conscious of this question ourselves and are thinking through our own structures—the innovation board the combined authority set up, all of the institutional structures—and what more we need to do, but the honest truth is that thus far we have found that position on that graph difficult to move. My contention would be that that cannot be the right position for this region to have and we do need to ask ourselves what needs to happen with Government and all the institutions of government to shift that position for the benefit of the UK overall.

Q148 **Chair:** Thank you very much indeed; that is very clear. We will publish the chart that you mentioned on the Committee's website, for anyone tuning in.

Perhaps I can turn to Professor Collinson. You have the analysis from the Mayor there as to the relative underinvestment from the public sector and very strong performance from the private sector. Based on your analysis across the whole region over many years, is that a picture that you recognise and agree with? If so, what are the causes of that? Do you have any insight into that?

Professor Collinson: No, it is an accurate picture. We have about £83 per capita in public R&D spend against just over £400 in private investment, so it is a very attractive region for private investors in R&D. There are quite excellent multiplier effects from that investment in R&D. There are a number of reasons for this and we have done very well for a brief period of time in Innovate UK funding, which is a particular stream of funding to regions, particularly around catapults. We had about 14% of national funding in Innovate UK for a brief period in 2018 to 2019. That has gone down to 7.7% in the last set of figures. There are peaks and troughs in the flows of public R&D money, but over the five to seven years that we have mapped this, it is the lowest region for this.

There are number of issues. First, as I think everyone knows, there is a concentration of public R&D funding in the south and south-east in the golden triangle. About half of public R&D goes into that area. This is good for the country. We need to be global leaders in science and technology and be at the forefront of science and technology, but you could argue that there is a slightly blinkered view about what regions like the West Midlands have to offer and what the opportunities would be in terms of beneficial outcomes if further R&D funding was put into regions.

It is blinkered in a number of ways. First, we tend to be characterised correctly as the centre for automotive and advanced manufacturing. We are absolutely excellent at that. We have a higher number and range of top class R&D intensive firms and excellent connections with not just universities directly, but via intermediaries. These intermediaries are superbly important, so the MTC, WMG, the ITM in life sciences and Tyseley energy centre for the energy field. These are translators of pure R&D into what firms need in applied technology and commercialisation,

but they are also skills developers. One of the things we need to do is connect skills very explicitly in upskilling to flows of R&D into regions and these intermediaries do that very well. I can come back to that.

The first thing therefore is that we are characterised as a very narrow offer in terms of our science and technology area. It is correct that we are very good in that area, but we have a very strong critical mass in several other areas. One of these is clean technology and energy. We have done analysis across different regions and have an advantage in skills supply, but also in technology development in those areas.

The second is life sciences. Again, that is a hidden and sort of latent competitive advantage for the region, which I think further investment would unlock, with again strong multipliers to regional strengths in firms. I think it is important to connect those two things. It is about supply side of science and technology and demand side.

Q149 **Chair:** Thank you very much indeed. Before I come to Zarah and Carol, just to push a bit further on the causes of the relative underperformance of the West Midlands in terms of public funding, what you have described, Professor Collinson, is disciplines with an applied orientation, if I might describe it that way. Is the relative disparity because the funding is going less to the applied disciplines or those parts of disciplines that are applied and more to the theoretical and abstract? Does that cause the disparity or is there a kind of gravitational pull of some of the particular institutions in other areas? The Mayor mentioned the east of England being driven by Cambridge. Is it that? Is it the institutions in other areas or is it, as it were, the ecology of who makes decisions? Are you less represented on the key committees? What drives this distribution?

Professor Collinson: It is an excellent question and it is a complex set of factors. There are institutional structural issues with how funding is allocated, I would suggest. I think in particular, though, if you look at the differentiation between Research England funding, Innovate UK funding and the catapults versus the research councils, you do see a relatively low hit rate, particularly for the region in EPSRC and MRC, the two research councils that have the largest funding budget. We punch above our weight in research councils that spend lower amounts, in smaller amounts of funding, but we punch well below in those. This is the pure end of science and technology and R&D if you look at the research councils.

We have done well in the applied area, in the Innovate UK and the catapults area, but that was relatively temporary and it was focused on one area. We have done relatively badly in those high-end areas and you could argue the cluster of universities is not as strong as in the north-west and certainly not London and the south-east, or you could argue that there is some issue with the way that we are bidding for funding, because the award rate per bid from our region and the collective universities in the West Midlands is a lower hit rate than from other

regions. We are trying to investigate precisely what is underlying that. It is a good question though.

Q150 **Zarah Sultana:** Do you think that the Covid situation in particular allows the region an opportunity for economic growth and are there particular local assets that can be utilised for that?

Professor Collinson: Yes, in a nutshell. Both the Covid impact and frankly Brexit—and we have tracked these two economic shocks on the region—hit this region exceptionally hard. For a start, we have a very low-income, low-skills and high-deprivation population—so low household income and low skills—and the starting point was not good. Secondly, we have a high quotient of manufacturing firms in the region who were hit hard by Brexit and subsequently Covid, and now by logistics and supply chain, so recovery is more of a challenge for the region.

Going into your second question, some people use the term "pivot". We have seen the agility in the region to shift the number of assets, and I think in particular R&D centres, medical schools, universities and beyond, to face the challenges of the pandemic quite effectively—anything from making masks to testing facilities on campus to what we do in my institute, which is using our analytics to track where Covid is having an impact, and what the knock-on effect to householders and businesses is, including furlough rates. We report every two weeks to the Economic Impact Group chaired by the Mayor.

When you look at particularly the life sciences and the healthcare infrastructure in the region and see the ability of this and other regions to shift direction and focus resources and assets into coping, I think it is an exemplar. I think it has been spectacular in terms of the adaptability of the region, but we have a long way to go in recovery. I would urge that further investment in life sciences and the healthcare infrastructure at the local level. Because of the ability of regions like ours to adapt, when you can act locally with local resources, I would urge the institutional infrastructure and the R&D to be thought of together when we think about these things in future responses to shocks like that, yes.

Q151 **Zarah Sultana:** Building on that, Andy, what local strengths within the region are being prioritised in that Covid recovery?

Andy Street: I will broaden the question a touch, because we are trying not just to think about a Covid recovery, we are trying to think about a full economic recovery and what underlying trends have changed as well in our recovery. I think you have to take the net zero piece alongside the Covid recovery.

Let me pull out three things we are trying to do in three different sectors. It very much links to what Simon was talking about: building institutional strength that will enable us to take a greater share of public R&D. The first is to build our strength in the life sciences sector. We have worked hard for a number of years to get the private sector investment off the

ground, with Bruntwood and Birmingham University, to build that research intensive life sciences park in south Birmingham. We are also proposing something similar around the HS2 interchange station in Solihull. We are very much trying to increase our share of that growing market and use the collaboration with the university to do that.

The second area that we are obviously thinking about as we move towards net zero is the electrification of the automotive industry. That is both an opportunity and, frankly, is defending our piece. If you ask me what the single biggest priority is, which I know you are extremely familiar with, it is to win the battery factory in south Coventry. Again playing to the institutional piece—and it seems strange to be reporting this to a Committee chaired by Greg Clark, as he was the Secretary of State who brought this about—it was to win the battery industrialisation centre in south Coventry as well. Exactly the same thinking: what is the institutional strength that will then grow the private sector contribution? I would probably say that is the number one priority.

The third one I would pull out is very much this whole question of the decarbonisation of both our industry and indeed our housing stock. The institutional bid that we have put together, and thus far have been unsuccessful in—Clive Hickman was its author—is what we call the national centre for the decarbonisation of heat, very much to be seen alongside the facility at Tyseley that Simon referred to. Again, you see the principle. We are trying to learn from what we have done in automotive, where those institutions draw in investment to build that capability in other areas.

Q152 **Zarah Sultana:** Thank you. If I can follow up on the point around the gigafactory in south Coventry, what representations, if any, have you made to the report that the Secretary of State for Transport has been actively lobbying against Coventry Airport being used as a gigafactory?

Andy Street: Yes, it was in *The Sunday Times.* We have not had any confirmation that that has been done, but we continue to make our case at the most senior level in Government. The Prime Minister and I had literally had a conversation about it only a few days ago. We will press on all of those positive aspects for why the case should be made, rather than engaging in frankly what I would probably describe as some rumour.

Q153 **Zarah Sultana:** Moving on to Dr Hickman, do you have anything to add to looking at the local strengths of the region in this economic recovery?

Dr Hickman: Yes. I would like to first go back to some of the things that Andy and Simon have said, talking about why we do not get the government funding into the Midlands. I don't know why we don't do that, but what I do know is that the Midlands is very good at attracting inward investment. Just on this site since 2012 we have secured £800 million-worth of inward investment, of companies coming on to the site here, which excludes the investment that has been made in MTC. It has generated over 2,000 jobs on this business park. The catapults are a

magnet for attracting inward investment. We need to find out how we can use that magnet to attract the Government investment.

The second point that was talked about was the balance between R&D. Yes, there is an imbalance. There is a lot more money invested in R than there is in D. We need to get that balance right, but I would urge that if we get it right, it is not by reducing R, it is by increasing D.

Moving on, how can we pull more of the Government investment into the Midlands? I think that ARIA is probably a strong opportunity for us. We are already making a case that says the West Midlands is absolutely the ideal location for the new ARIA programme when it comes into existence. If we can bring that here into the Midlands, I think that will have a very strong opportunity to pull in more inward investment and also to pull in more Government investment into the Midlands region.

Q154 **Zarah Sultana:** Thank you, Dr Hickman. What role is the recently formed Midlands Engine Business Council playing in the region's recovery?

Dr Hickman: I think that Andy would probably be a better person to answer that than me.

Andy Street: I think as yet, relatively little, if I am honest. That does not mean it is a poor thing to do; it is the right thing to do. The idea of it was very much that a number of senior leaders from business would be able to speak directly to the Secretary of State, then Robert Jenrick, in his role as the Midlands engine champion. It was a sound idea, but I think it would be difficult to say that it has drawn up any strategy as yet. Perhaps it is worth just being very clear: the economic strategy for the West Midlands is distinct to the East Midlands and I think it would be accepted that it is the combined authority that leads on that, drawing in input from all of our partner organisations, but we very much see that as our primary responsibility.

Q155 **Carol Monaghan:** I have a whole pile of questions here that have arisen since hearing what people have said. Maybe I could start with Dr Hickman. You are talking about increasing D and I think pretty much every member of the Committee would support you in that. Do you think we should be more prescriptive about percentage or amount of D spending in terms of public spending, because at the moment it seems to be just a bunch of money that is distributed?

Dr Hickman: When you look at the investment in a new product or a new technology, the research element is about one-tenth of the total cost that needs to go into that complete programme, so one-tenth of the investment is in the R and nine-tenths are in the D. It does not need Government to put the nine-tenths into D, but it does need the Government working in parallel with industry to try to support that D. Right now I suspect we are seeing in the Midlands that most of the D is coming from industry and very little is coming from Government. That is

where the balance needs to come back. I don't know whether you can be prescriptive and say 50% of it should be in R and 50% in D because it will vary depending on the product or the technology that you are working on. I would prefer not to be prescriptive. I would like to see the 2.5% in R&D pulled forward rather than slipping out, as we have seen in the CSR.

Q156 **Carol Monaghan:** Your comments about ARIA are quite interesting. You talk about ARIA being based here, but of course ARIA is something that is open to bids from across the UK. The ARIA money isn't that much in terms of the entire science budget, but do you see it then being able to unlock other public funding that might come in off the back of it?

Dr Hickman: I think it would unlock a lot more private sector funding rather than necessarily public funding. I think that despite it being a small amount of money, it is still more than the money that we get totally into the West Midlands region right now, so it is a big number in real terms. Having it located in the Midlands does not mean that all of that money would be spent in the Midlands. You are absolutely right that it would be across the UK, but I think with it being in the Midlands it would again become that attractive magnet for more inward investment into the region.

Q157 **Carol Monaghan:** But it is not changing, because we have already heard from Andy this afternoon about the tiny amount of public funding that comes to the West Midlands. That will not necessarily change as a result of that. You have talked about it unlocking private sector. Sorry, Andy, you want to come in on this?

Andy Street: Do you mind if I just contribute on that? I think it could change our public funding performance as well in three ways. One of the questions the Chair asked Simon was: is there something about who is in these bodies and is there enough understanding of what we do here? I think if there was a presence, that understanding would naturally improve. There has to be a link between ARIA and the other research funding bodies—the public research bodies. It is those outcomes that we need to change.

The third link is between that organisation and the institutions of Government that drive inward investment as well. Let's just be clear: we have an extremely good record. We have been for the last five years the best region outside London by some way, so it is a strength on which we can build for UK plc. Again, it is this irony of brilliance in some areas but relative weakness in others that I think we see decisions like that would try to rebalance that.

Q158 **Carol Monaghan:** We have talked about the importance of bringing in additional public funding. Have you any sense of what the benefits would be? Are we talking about capability benefits? Are we talking about economic benefits? Is it both? What sort of ideas would you have?

Andy Street: I will be brief. Simon is the economist in the room, so I will him answer. Let's just be clear: again, there are three things. Of course it has an economic benefit, there is absolutely no question, and you can do the maths on that. Secondly, it is about the strengthening of some of our latent sectors. The theme that goes through this is yes, we have had for 40 years some outstanding success areas, but they are not broad enough. What we are trying to do is build our life sciences capability, we are trying to build our capability in energy storage and distribution, and we are trying to building our capability in fintech.

In a sense, the word "translational" that was used earlier on is so important, because that is what gives us that sort of step up. That is the advantage we are trying to draw out of this. Frankly, the advantage is the levelling-up word. It is about broadening more of the country and moving away from what I believe is an overdependence on one area of the country. Those are the three advantages I see.

Professor Collinson: It is a very good question and it connects to the ARIA question in a sense. There are several direct benefits that come from attracting R&D intensive firms or public sector R&D. The first and foremost is it tends to attract higher income, higher-skilled individuals, so your average GVA per capita—per head—and your productivity numbers go up. In very science and technology-intensive labs in either advanced automotive or life sciences, you can literally double your average GVA per person. This is the first good thing.

The second good thing is that it can have a cluster effect—an agglomeration effect. A world-leading centre can attract foreign direct investment and investment from other parts of the region. Again, you bring in additional higher than average skilled individuals who have a higher income. Those trigger very good multiplier effects. The secondary employment—the indirect employment effects—very good because they have high spending power.

There are two pitfalls here we need to be aware of. First of all, R&D investment in some contexts has negative displacement effects. The trade-off for Government at the regional level is quite difficult. We need to grow both productivity and the scale and size of economies as well as the efficiency, but we have to reduce inequality and deprivation, and have inclusivity and then sustainability. There are growth poles, or pathways. and in a sense there are trade-offs here. Displacement effects from some R&D investment means you increase house prices and costs and displace low-income, low-skilled individuals from the centres where the employment is, and it can have a negative effect on equality.

There are two things tying this together. One is skills. If the investment comes with a budget for upskilling—again, this is the kind of thing that MTC, WMG and other places do—it enables less skilled people to benefit from that catalyst, that investment. Skills bridge household income and productivity.

The second dimension is to do with the alignment between the R&D you are investing in. I am not very clear what ARIA is, so if somebody explains what it might be, I will be able to judge this.

Carol Monaghan: We are trying to work that out ourselves.

Professor Collinson: Brilliant. But what we know from our studies of different regions globally in the UK, there is alignment or misalignment between R&D centres, including universities, and what is in demand from local firms in terms of innovation. Alignment means there is a very good flow through and a commercialisation, and again intermediaries help with that. Misalignment means universities are there, but they don't touch the sides. They have no real impact, except those direct employer impacts, on their region. That alignment question is very important to try to improve the regions in the UK.

Q159 **Carol Monaghan:** Thank you. Chair, do I have time for one more? Thank you. I think Andy might be best placed to answer this. Given that the West Midlands is a particularly business-led and innovation type area, what impact has the pandemic had on this? Do you see the West Midlands as being particularly vulnerable in this area?

Andy Street: I think Simon said earlier on that we have been the worst hit of any region in the country in terms of the reduction in GDP for the year 2020. It was not a surprise because it is what was predicted by all economists before the pandemic developed and it was simply a reflection of the sectoral composition of the West Midlands economy. This is a simple way of describing it, but people just think, "Oh yes, I get what he means" when I say this. If you think of the business tourism sector, where we had a market share of over 50%, it has been closed for 15 months, so it disappeared. That categorically has more impact here than anywhere else. Tourism is returning, but not business tourism. That is what happened.

The particular point that drives this graph, and the other thing that has happened, is that business investment has also been cut substantially. You will have had all this data, I am sure. It is coming back now. It is difficult to predict this, but I don't see anything that says it will come back less strongly in this region than anywhere else, but because we are particularly driven by business investment, not by public investment, that reduction has had a greater impact on our GDP than if we had the opposite of this graph. The point that you are drawing out is correct.

Q160 **Carol Monaghan:** Is there any way to build more resilience into the area?

Andy Street: This is the point about building the clusters that have the highest potential. The work that we are doing at the moment is slightly different to the local industrial strategy work, because that work was very much, "What are your outstanding sectors? How are you going to grow them?" We did that well; that wasn't wrong and it remains the right thing

to do, to double down on those. But the new work has an additional element, which is, "Which could be the sectors of strength in the future?", because that will build resilience, and that is why we have to use public investment to build the institutional capability in those sectors as well as private investment.

Q161 **Aaron Bell:** Thank you all for coming. Continuing with the graph that you brought us, Andy, obviously as a West Midlands MP I will not argue against more public money coming in, but say we got that doubled from where we are at the moment, how much more private investment would that leverage? It will not maintain the current ratio we have, which is the highest in the country, will it?

Andy Street: No, of course it will not, but I think a very big question is which sectors that investment comes into, because our private investment is also very concentrated in certain sectors. In a sense, I am being unimaginative in answering this question, because I am making the same point again. For the resilience issue, we have to increase our private investment in complementary sectors. One of the ways of doing that is building the public structures as well. I might just ask Simon if he wants to comment on that.

Professor Collinson: It is a good question and I do not think the ratio will be the same, no. I think it is an opportunity to expand the portfolio of strengths in the region. I think that is very important. What we have discovered is that there are latent or nascent competitive advantages in the assets and capabilities we have in the region. There is scale, but there is also a level of specialisation. Out of an excellent legacy of automotive advanced manufacturing, we have really superb capabilities in space. You would not know that if you looked at SIC codes or firms; you would only see it if you did a fairly good diagnostic on the assets, capabilities and skills that are held within automotive and the contractors that work with automotive.

By bringing public sector R&D to again pivot and shift some of that manufacturing focus on to either creative and/or space and/or, for example, life sciences, where some of those skills are really needed and to use those skills to boost those areas, we are almost bringing about an accelerated shift to new areas and emerging industries. That is where public money can be catalytic. It would again attract different kinds of private sector investment in R&D, one would hope, in those new areas. That is what we desperately need.

Q162 **Aaron Bell:** Thank you, Professor Collinson. Again, turning it on its head slightly, could this region serve as a model for other regions in terms of how you can leverage more private investment into R&D? Are other regions interested in why we are doing so well with private investment, either to Andy or Professor Collinson?

Andy Street: Not that I am aware of.

Aaron Bell: No, they are not beating a path to your door?

Andy Street: No.

Professor Collinson: I think you have to switch the question around a bit. It is normal that public sector R&D investments are used to leverage and attract private investment. We have done very well without it and the question is how much more we would manage to do with it. I don't think we are exemplar in that sense. We do very well in foreign direct investment and, traditionally, exports, but again in a narrow set of sectors. We need to grow that portfolio to improve the regional resilience.

Aaron Bell: Dr Hickman, you wanted to come in.

Dr Hickman: Yes. I think we have a ticking time bomb if we are not careful. We have all of this private sector investment, a lot of it coming into the auto sector, but we need to recognise that we have 42,330 people employed in companies making vehicles with internal combustion engines. Those 43,000 jobs are at risk at the minute and they are at risk because of the net zero strategy to move towards electric vehicles. We have to do something to reskill those individuals, to be able to train them to do other things for the future, so it is reskilling and upskilling. That money is not necessarily going to come from the private sector and that is where we need help from the public sector to kick start that work so we can get these people back in employment in the future or keep them in employment so that we don't have a crisis in 10 years' time.

Q163 **Aaron Bell:** Thank you. I was going to come to you anyway. I am obviously struck by the tour that we just had and Ken Young and Richard Watkins telling us about the point you made earlier, the difference between R&D and the difficulty in getting particularly SMEs to adopt some of the amazing things you are doing here. Where are the barriers to commercialisation of research in this region, how do we overcome them and how do we make SMEs more aware of what you offer here at the MTC?

Dr Hickman: We use a large chunk of our catapult funding to support SMEs, to be able to engage with them, to show them what their capabilities are. For every SME that we have worked with, we have been able to introduce advanced manufacturing technologies that have displaced people from their current job, but along with that we have provided upskilling and reskilling to those people, which has allowed them to take on better paid, cleaner, safer jobs for the future.

The problem is the amount of funding that we have to do that is too small. While we have been successful with the companies that we work with, it is the tip of the iceberg. To have real societal impact, we need to be able to invest a lot more money in that activity. The Made Smarter programme is important for that. That was led by Juergen Maier. We got a good proportion of money from that into the West Midlands, but it is still not enough to be able to get to where we need to be to retrain all of

these 43,000 people in order to be able to move those companies and pivot those companies into different sectors and different products for the future.

Q164 **Aaron Bell:** Thank you. Just on the ARIA point, because you raised it earlier, obviously ARIA will be a funder of real leading-edge projects. Do you think you have potential projects you are hosting here at the MTC that would be looking into bid into ARIA, as well as the idea that we might want to host ARIA itself in the West Midlands?

Dr Hickman: That is absolutely true. There are a number of products that are sitting with SMEs right now where we are looking to get investment from the venture capitalists and from the investment market to bring them to the marketplace. If ARIA was in place and we were able to leverage that, I think leveraging ARIA money with the venture capitalist money would be game-changing to get some of those unicorn businesses forming.

Q165 **Aaron Bell:** There are some interesting funding models envisaged for ARIA as well. Finally, if I could turn back to Andy Street about Government relations and so on, what challenges has the pandemic posed for relations between local and national Government, in your experience?

Andy Street: There have been some strengths; there have been weaknesses. The question is not particularly around R&D and innovation, is it, or are you looking at—

Q166 **Aaron Bell:** I mean in terms of what you are seeking to do with the recovery. Have you had some challenges around that because of the stresses of the pandemic?

Andy Street: No, we haven't. That would be wrong. The tensions with Government during the pandemic were over material, which has been covered very broadly, and is the whole question of the tendency towards centralisation and our view that some things could be done better regionally or locally. In terms of the plan for the recovery, I would not say this has been a particular stress. I would say we have struggled to get a hearing of the quality that we have had today on this point, which I keep making, of the irony of our situation. It has been good that you have looked at this in detail.

If I can make one point, though, that talks to what Clive referred to, I think the scale of the challenge in the change for the automotive industry is vast. Whether that is truly understood by policymakers, I am not sure. I will just give you the stats, which I think illustrates this. JLR's commitment in terms of investment behind its net zero work is £2.5 billion per year. It is an eye-watering sum of money, but that is what it believes it has to put in to achieve the Government's target of zero sales of ICEs by 2030 and hybrids by 2035 and maintain the sort of volume it needs to employ the number of people it needs.

There are huge issues with the public policy support for that, particularly through the tier 2 supply chain companies. We are seeing real pain with some of them not being able to make that transition. I think it is not a direct recovery from Covid answer, but it is an answer about the transition that we have set out upon and the vast scale of challenge that change involves.

Q167 **Aaron Bell:** Thank you. Finally, just to be a little parochial, you have done a superb job banging the drum for the West Midlands Combined Authority, but the West Midlands is obviously wider than the area that you cover. I represent north Staffordshire.

Andy Street: Of course.

Aaron Bell: We have a couple of excellent businesses coming to give us evidence later today. How do we make sure the wider West Midlands gets the benefits of the work that you are doing here in the combined authority?

Andy Street: I could say that Staffordshire does very well banging its own drum, is my perception. Your MPs for Stoke certainly do extremely well and you have done relatively well in some of the innovate public funding pieces, and better than the area that we three all come from. I hope what has come out from today is that we are trying to think about the genuine strengths of the region across the piece. For example, when we met Government Ministers, the ceramics industry was part of the story for exactly the reason that you are implying.

Q168 **Chair:** Thank you, Aaron. Just before I turn to Rebecca Long Bailey, perhaps I could just follow up Aaron's question to Dr Hickman. We have had the privilege of a tour of the Manufacturing Technology Centre this morning and you had an exchange about projects that you are working on that might attract interest. For people that are tuning in from outside this room that have not had the tour, just give us an example of one of the projects that is current and that we might benefit from a wider knowledge of.

Dr Hickman: I will give you one that you probably did not see this morning to try to widen the scope of what we do. We have been working in laser processing for the last 10 years here at MTC and looking at how we can use lasers to develop better solutions to problems. We were approached by one of the large food companies—I will not say the name on film—and it asked us if we could help it with ice cream manufacture. The problem that it has is that when it is making the ice cream, it needs to clean the plates every two hours because the plates clog with ice cream. That ice cream gets wasted; there is time wasted in cleaning the plates. What could we do? We came up with a solution, which was laser etching the plates so now it only has to clean the plates once every shift.

We have then used that technology on bearing surfaces: how can we improve the quality of bearing services so you reduce the friction? We are

looking at how we can apply that now to ship building and if we can use the same technology on the hulls of ships, to improve the hydrodynamics, reduce the fuel consumption and the energy consumption of a ship. We are about to launch that as a company into the marketplace. That really does have the capability of being a unicorn business within 10 years.

Q169 **Chair:** Thank you. That is a great illustration of an important point. We have been talking quite a bit about sectors and the Mayor has talked about sectors that have potential to grow, but a lot of what we see here are cross-cutting innovations that can be taken from one sector and applied to a different one. We ought not to lose sight of that as an important contribution to future growth.

Dr Hickman: From our perspective, we have always said that we are sector-agnostic. We are looking at technologies and how we can translate them from one area to another area. Automation is a classic one—how we can move that into different sectors—but we are also now working on looking at how we can use modern methods of manufacture to do modern methods of construction. I think you saw this morning some of the things that we are doing on construction that will be game-changing for the industry in the future.

Chair: Thank you very much indeed. My question has piqued the interest of Carol Monaghan, so I will bring her in briefly.

Q170 **Carol Monaghan:** Thanks very much. The ice cream got me excited, but how would a business like that know to come to you and seek that help? What sort of transactional relationship would you have with that business?

Dr Hickman: We have our own business development team. We do promote ourselves in the media, but one of the big sources for us are the banks. The banks have lots of business managers that are working with small and large companies, so we have a strong relationship with all the regional banks. We work with them. The building that we are in today was partially funded by Lloyds Bank to improve the apprentice training capability for the region, but the banks bring customers to us who have a problem.

Someone will go to see their bank manager; they may need some funding for something. The bank manager will come to us to say, "Is there anything you can do that avoids the need for this level of investment?", and very often we can look at a company and give them product improvement opportunities that improve their productivity by just changing the way they develop and deliver a product. That means we can save them on investment. That is a real strength of what we do here at MTC.

Q171 **Carol Monaghan:** Would they need to pay you for that or is that free?

Dr Hickman: When it is a large company, they have to pay commercial rates. It is part of the catapult programme that if we do work directly with industry it has to be at commercial rates because we don't want to be in a position where we would be undermining other people who might not be able to do that in a commercial environment.

With the SMEs, we are able to use some of that catapult funding to support a programme. An SME would come to us with, say, a project that is valued at £20,000. We can deliver that for £10,000, where we supplement it with £10,000 on a de minimis basis, so we do not breach any state aid rules. That SME can then use that project for R&D tax credits, which reduces its £10,000 further.

Q172 **Rebecca Long Bailey:** The UK Government's Made Smarter strategy set out to revolutionise manufacturing and bring it in line with other countries, such as Germany, who are way ahead in terms of advanced manufacturing. Do you think the Government is supporting the Made Smarter strategy to the extent that they should be? If not, what would you like to see happen next? We will start with Dr Hickman.

Dr Hickman: The simple answer to that is no. We would like to have a lot more funding. We did ask for a lot more funding through the Made Smarter programme, but the longer answer and the genuine answer is that the level of support that we are getting from the Government is helping us to make a difference. While it may not be adequate, it is certainly setting us on the right path to getting this implemented for the future. Digital manufacturing, which we talk about in Made Smarter, it is all about trying to make a bespoke product at the same price point and at the same quality that you make a mass-produced product. If we can do that for our SME community, it has game-changing impact on their productivity. We have already seen a number of companies that have been able to increase their turnover and increase their market share and particularly increase exports through the Made Smarter programme.

Andy Street: It is a great programme. I have visited some of the companies that are taking part in it across the West Midlands and it is very clear that there is a business case behind doing it at great scale.

Another programme that the Government have put a little bit of money on the table for is the whole decarbonisation of industrial clusters that we are leading in the Black Country, another very good example, where it is a small pilot scale at the moment. What I feel we have to do is make the case for growing the scale of that by showing the individual improvement for individual companies.

Rebecca Long Bailey: Great, thank you. Professor Collinson.

Professor Collinson: Thank you. Yes, I think it is a great programme too. It has also undergone a bit of an evaluation and that evaluation shows that the outcomes are very positive. We could apply those evaluations and apply a bit more precision and intelligence on other kinds

of investments and interventions. That one in particular has affected a small proportion of the SMEs in the region, just as Clive said. Scaling it up and focusing it a bit more precisely could really snowball that impact. The problem with the region is we have a very long tail of low productive small firms. They have not invested over quite a long time in either skills or capital. The dilemma is if you invest capital in automation, you don't employ as many people.

On top of Clive's comments about the transition to net zero automotive, McKinsey reckons there will be a 40% decline in manufacturing employment by 2040. On this idea of transitioning and pivoting and assisting firms to move into other areas, digital will grow by 20%, but again according to McKinsey's data, we are about 500,000 short of digital skills by 2030. You have to connect both skills and the interventions to the places and the firms and sectors, or cross-sector the places that need it most, I think.

Rebecca Long Bailey: Thank you. Dr Hickman, you want to come back in.

Dr Hickman: Yes. I would like to challenge Simon on what he said about how bringing in automation reduces jobs. I have never been in a programme where automation has reduced jobs. It has reduced jobs in that particular application, but by putting in a reskilling and upskilling programme alongside the automation, you increase the number of jobs in a company, you don't reduce them.

Q173 **Rebecca Long Bailey:** Thank you very much. The next question that I have stems from something that I think we were all struck by when we were doing our tour of the MTC. We looked at a ventilator that was produced as part of the ventilator challenge. When we were discussing the various components of it, it became very clear how reliant that ventilator is on labour and resources that come from overseas. This has been a problem in manufacturing for many, many years. The million dollar question is what do we need to do to reshore our manufacturing capability here in the UK? Is it just about tax breaks or are there very specific policy directives that the Government needs to put in place to encourage the investment in those areas? Starting with Dr Hickman.

Dr Hickman: I think that the first thing we have to look at is productivity. When we start to look at modern methods of manufacture and we bring in automation and digital manufacturing and lasers, we can increase productivity by an exponential rate. If we can then get that exponential growth in productivity into a product, you can manufacture that at a lower price point than you can in China or in any other overseas country. By getting the right manufacturing processes in place and putting the investment into the manufacturing processes, we do not have to do tax breaks, we can bring things back to the UK.

An example of that, which we did recently—I think I am allowed to use this company—was with McLaren. McLaren was making the body shells

for its vehicle in Austria. It came to the catapult centres. The MTC, working with the AMRC and the National Composites Centre, fully automated the manufacture of that body shell using carbon fibre. It reshored all of the production to Rotherham, and we know we can make it at a lower price point if we get the productivity right. If we put the investment into helping to improve productivity through things like the Made Smarter programme, I do not think tax breaks are things that will be important for that. We will be able to do it ourselves.

Andy Street: Two other things I would add to this mix. The first—we are yet to see how it plays out but I think it could be very significant—is the question of the new rules of origin, I will call it in shorthand, which obviously were negotiated in the Brexit deal. Our hope is that that will force industrial investment in the UK because it will mean that a product has to have a higher percentage of domestic or European production within it. I know that there are active discussions within big industrial companies in this region about the investments they will have to make to meet those requirements, so it is an interesting consequence.

The second piece I will put on the table—it is interesting, we have not talked much about this in the last hour, and I think it is a critical component in this whole debate—is about the skills available and particularly the higher-level technical skills. Some of the most encouraging West Midlands start-ups that may be the unicorns of the future are frankly there because of the technical education that we have seen people going through. I am a great optimist on this—that there is a swing of the pendulum to focus on, because that is also what will determine success. You ask most people here what their current biggest issue is and it is employing sufficient people of the right technical capability.

Professor Collinson: Just briefly, in the interests of time, I think there are two things here. One is we need to get much more precise at the regional level across the UK in terms of what are our real competitive advantages to attract particular kinds of foreign direct investment. Every region tends to say it is very good at everything, and that is a problem. Sometimes that is just marketing and sometimes it is lack of intelligence. It is just a lack of analytical intelligence about what the differentiator is for a firm from China, India or the US to come to a particular place. We need to get better at that.

Secondly, foreign direct investment is excellent because it is a net increase in investment. It is not displacing investment from other parts of the UK. Companies that invest abroad have higher productivity levels and they have generally a higher R&D intensity than local firms and create spill-over effects that are usually very beneficial for supply chain firms and others within the region, so more FDI is good. Precise targeting of FDI and encouraging those spill-over effects is part of the package.

Q174 **Rebecca Long Bailey:** Great. One very final question: the Government

are still focusing very much on 2.5% or so of our GDP being spent on R&D. Do you think that is enough, given that other leading industrial nations are spending up to 3%? Do you think we need to be more ambitious? I will start with Professor Collinson.

Professor Collinson: Yes, absolutely. That is a catch-up number and it has been delayed again, unfortunately. I think that is one issue, but the target needs to then be broken down, exactly as Clive has said, into the types of R&D. I absolutely think we need to fund more of these intermediary bodies that help commercialise and translate R&D anywhere for regions or within regions for regions. That is critical.

Andy Street: It looks an ambitious target. You might have seen the two lines on the graph that I sent around. The intersection of the two lines is where the 2.4% would put us, and as you can see there is no region of the country that is achieving that. We are a very long way from it, as indeed is everywhere outside London and the south-east, so it seems to me to be a stretching target from where we start.

I think the point is that we believe the institutions that translate research are the best way of moving that. Dr Hickman runs one of them. You have all talked about the admiration you have for it. We do not have those translational facilities in other sectors where we can lead.

Rebecca Long Bailey: Finally, Dr Hickman?

Dr Hickman: I cannot say much more than Simon has said. It is a good start. It has been delayed and we need more.

Rebecca Long Bailey: Brilliant. Thank you very much.

Q175 **Chair:** Thank you much, indeed. Just a final point, first of all, it is not really my place to correct witnesses but I do not want it to be conceded that the 2.4% has been delayed. In fact, it has been reasserted so I do not want to encourage anyone to think it is accepted that that is the case. The £22 billion of public investment has been put back a couple of years but as far as we understand, the Government retains its target of 2.4% of GDP. I do not want them to be let off the hook on that.

My final question is for the Mayor, building on something that Aaron said. The 2.4% is public investment and private investment in R&D and in the presentation of the budget the Chancellor made the case, which to many people was surprising, that the level of public investment in R&D in the UK is higher than many countries but the level of private investment is less. One of the big requirements over the next few years is to increase the level of private investment. If we are to look at the performance of the West Midlands, even accepting there are opportunities for more public investment, you are the region in the country that shows how you can get much more private investment made in R&D.

What does the West Midlands have that our inquiry can draw on to commend to the rest of the country? Andy just mentioned institutions

such as the Manufacturing Technology Centre. Are there are other aspects that can be copied from the West Midlands and applied more generally?

Andy Street: Nice question to finish with, Chair. I think I would call out three things. You are right to say the institutions. There is absolutely no question that if you look at the automotive sector, we have an incredible concentration of the institutions, so that is definitely right and it is why my previous answer to Rebecca Long-Bailey was that we need those in other sectors as well.

The second thing we have, and I think this is a really important point, is a real deep concentration in certain sectors. It is both a strength and a weakness, but we are where we are on that graph because, in terms of a proportion of the UK R&D within certain high-value advanced manufacturing sectors, we have a vast concentration and we know that draws in other enterprises. The theory of clusters is what lies behind that.

The third piece that lies behind that is that our universities are very focused on those areas as well. I would say—and I have to with Dr Hickman and Professor Collinson sitting here—that there has been incredibly good collaboration between the universities and the private sector in driving that. As Simon acknowledged earlier—and given his employer is the University of Birmingham, it was a good thing to say—we perhaps have not been as successful in totality with our universities, but that positioning is because of the focus in our universities.

Chair: Thank you very much. I thank our three witnesses—Andy Street, the Mayor of the West Midlands; Clive Hickman, the chief executive of the institution in which we have the privilege of sitting; and Professor Simon Collinson of the University of Birmingham. Thank you very much indeed for giving us a great start to our inquiry here in the West Midlands. We are going to say goodbye to our first three witnesses and as seamlessly as we can, we are going to invite our next pair of witnesses to join us.

Examination of witnesses

Witnesses: Tony Kinsella and Stephen Malone.

Q176 **Chair:** I am very pleased to welcome two people in technology businesses in the West Midlands region. I am very pleased to welcome Tony Kinsella. Mr Kinsella is the chief executive of Lucideon. I will ask him to summarise the business in his own words rather than me give a potted version of it. I am also very pleased to welcome Stephen Malone who is the group chief executive of the Malone Group. Perhaps, Mr Kinsella, tell us a bit about Lucideon.

Tony Kinsella: Thank you, Mr Chairman, and thank you for the invitation. Lucideon is formerly the British Ceramic Research Association based in Stoke-on-Trent. I will repeat again—the centre of the universe for the UK. Its heart was in ceramics, very much the traditional ceramics

of cups, saucers, plates, tiles and bricks—important products. We have repurposed that organisation in the last few years around advance materials and advance ceramics so it is still one of those arty-type organisations, but a private organisation that intervenes and helps organisations take materials to the forefront of development.

Chair: Thank you very, indeed. Mr Malone?

Stephen Malone: Thank you very much, Mr Chairman. My journey is slightly different. I am obviously not from this area. Malone Group began life in Dublin in 1999. We describe ourselves as a project delivery company. We help companies with their capital investments. We have had a UK office since 2011 and we are active in Canada and Bulgaria. Over the last number of years, we have been focusing on changing our business to take advantage of the opportunities we saw coming down the line in the area of the smart factory and emerging technologies.

Q177 **Chair:** Thank you very much, indeed. Mr Kinsella, obviously the nature of our inquiry today is about the West Midlands in particular and what kind of a business environment that is. Tell us what it means to be in the part of the West Midlands that you are, in Staffordshire, and how important is the place that you are in to the way that you conduct your business?

Tony Kinsella: I think that is a good question. As I said, north Staffordshire is famous for ceramics, but also for transforming materials. If you look at its history, coal was at the base; coal for the ceramics industry, coal to create steel, and then obviously clay to make the products. It has had a 250-year history of transforming materials into higher value materials.

It has also been at the head of innovation. If you think about Wedgwood, we talk about pottery, but he was an inventor. He invented different types of pottery but he also invented things like pyrometry. He was a scientist and a curious engineer, and a business person. He was involved in the canals, so very much that commercial person and technocrat that I thrive on.

That is the background and if you think about north Staffordshire, it has somewhat been an artisan-type industry, and knowledge has been retained in the business and everyone has their own practice. It has been less of an engineering focus in many ways. The joy of the West Midlands connection is that the West Midlands, as Andy Street and Co have just talked about, is the heart of engineering in the UK, and we are able to engage with a broader range of engineering industries to turn an artisan-type industry into a more engineered product from the R&D and development side, but also into the application, understanding the needs better.

Q178 **Chair:** In terms of the ceramics industry, with ceramics people, in their mind's eye, picture pots and Wedgwood and all the rest of the things, but its scientific applications are very important. In fact, we saw some during

our tour of the Manufacturing Technology Centre. It is a very traditional sector in Staffordshire. How is that making the transition to the new applications, or perhaps you will tell me its history has always been about applying the latest possibilities?

Tony Kinsella: Yes, it is only at the early stages of taking on the new materials so it is still about making the products that it does very well. It has made those ever better. It has invested heavily in technologies to improve the products but it has not yet seen the opportunities itself of the advanced ceramic materials. I think partly that is because both local government and even Government itself sees ceramics as pots and plates, and we have perhaps not advertised the market ourselves very well.

If you think about where advanced ceramics are applied, how many pieces of advanced ceramics are in the mobile phone? Six hundred is the answer. Without advanced ceramics—maybe to our benefit—we would not have these things. We would not be flying. The engines that you sit and watch go around before take off are absolutely dependent on thermal barrier coatings, which are highly advanced ceramics without which the engines would melt. I do not think we understand the societal impact of those sort of technologies. We are involved in ceramics in healthcare. A huge amount of our bodies can be replaced and supported by ceramic materials. I think perhaps the industry is lacking in itself the ability to bring out that knowledge.

We are one of the most advanced academic areas in the world for studying those materials, but the application of them is taken up in Japan, Korea and the USA. We have not seen the economic impact here of how those three great powerful regions are exploiting high-value technologies. We do not need to compete on price, but we export our academic expertise to manufacturing and development in those countries.

Q179 **Chair:** Mr Malone, just on the regional aspect, you obviously operate internationally as you have said. Is there a particular rationale for the West Midlands's connection? Does that contribute anything in particular, or could you locate the business anywhere in the UK?

Stephen Malone: When we first invested in the UK 10 years ago, we were in the north-west because that was where two existing customers were based. We then acquired a company in Lichfield and another company in Manchester around the same time. We conducted an analysis at that point of the north-west against the Midlands as areas to have our main base. While we do have operations in the two locations, the decision was made to locate in the Midlands for a number of reasons: access to our customer base—we have a cluster in the north-west with a cluster around the Northamptonshire area—and access to talent. I would concur with what Tony has said about being a centre of excellence. There are a lot of world-class engineering companies in this area and that all led to the decision to base ourselves here.

Chair: Thank you very much. We will go to Zarah Sultana, Aaron Bell and then Rebecca Long-Bailey.

Q180 **Zarah Sultana:** Tony, we heard in the previous session how the West Midlands was hit quite hard by the pandemic, especially the sectors like manufacturing and tourism. What was the experience of the ceramics industry?

Tony Kinsella: I guess I could say, sadly, a disaster area. They are very focused on hospitality and most of the industry completely closed down while we did not go out to eat; their lines were closed and the like. In the deep dark of 2020, things were pretty poor in the area, but I think there has been a good, strong recovery, which is great to see. Perhaps there is more diversity in the rest of north Staffordshire. It has become a very strong logistics hub. As we all purchased from home, another part of north Staffordshire revived, but it is a transient industry; it is quick, it creates jobs, it gives the numbers, but it is a very transient industry moving in and out depending on where local government may support it.

Q181 **Zarah Sultana:** That demonstrates an industry that is able to adapt and evolve given the circumstances. Have you received any Government support to help companies in north Staffordshire and the rest of the region?

Tony Kinsella: Yes, we are perhaps one of those companies in north Staffordshire that Aaron talked about where we have been very successful in innovate bids. We just secured £18.3 million from the Strength in Places fund, which is part of the £42 million project—so £18.3 million from the Government, the balance made up from ourselves in industry. We constantly have about five or six Innovate programmes ongoing. It is tough bidding for those programmes. I think the SIPF was a four-year journey, and it needed resilience and persistence to get that through. I think that may come back to some of the other questions as to why there are not the applications for public funding. It is a tough old world, especially if you are an SME.

Q182 **Zarah Sultana:** What is it about those bids that you guys have made to Innovate UK that have been successful that the rest of the region can learn from given how low public funding is?

Tony Kinsella: A mix of things, I think. One is beginning to learn the language. People try to distil something out of the questions, and it takes a while to understand what is really being asked for. I think you need the right collaborations. When we started, our win rate was very low and we focused on what we could do ourselves. The SIPF now is a collaboration called the Midlands Industrial Ceramics Group, led by Rolls-Royce. We have JCB in it and companies such as Vesuvius. That very strong industrial need is exemplified, not just stated in the document, because they are helping to lead the bid.

Q183 **Zarah Sultana:** Stephen, what has your experience been during the pandemic and as we are coming out of it?

Stephen Malone: We were coming out of a very challenging 2019 on the back of Brexit. We operate in a capital world so any sort of uncertainty gives companies a reason to pause investment. We saw quite a lot of that at the end of 2019, and we were changing our business model at that point. We made large changes to our management team in the UK.

When the pandemic hit and we all went back to our houses, our first instinct was to ask how we could help. We have an R&D function that was quite young—it began in May 2019—and we got involved in two projects. I suppose the ambition at that stage, or the objective, was to do our bit. We got involved with an emergency ventilator design with MIT. A version of that ventilator—not our one but a version of it—was used in the New York emergency at some point along the way, and we got involved in sanitiser manufacture, neither of which were commercially beneficial to the company but, as I said, it was to contribute.

Towards the middle Q3 of last year, when things began to open up again, a trend began to appear and we were doing quite a lot of 3D scans in manufacturing organisations at night where our customers did not want people or contractors in but they still needed to progress design. We went in out of hours either in the evenings or at weekends and carried out 3D scans. That allowed a lot of detailed design to take place and projects to continue. In fact, the 3D models are so powerful we were able to walk contractors through to get tender prices. That has continued on into this year, and I think it is going to be a long time, if ever, before our customers are happy to have large groups of external people coming in.

The other thing that has changed, and the previous panel alluded to this, is the adoption of smart factory technologies. This has very definitely accelerated and we have lots of companies talking to us now. Where in the past it would have been a return-on-investment conversation, it is now a business continuity conversation. How do we use some smart factory technologies and what is coming down the line to make our manufacturing facility more robust in the face of possibly another pandemic, or in the face of another occurrence? We are having lots of conversations with companies around that.

There is a challenge for them because the smart factory world is so vast and it covers such an array of technologies; it is a big bite to chunk off. Companies come to the MTC when they generally have a problem to solve. They come to us when they need a road map because everyone's end destination for a smart factory is different. In a lot of cases, yes, we have heard about robots and we have heard about some of that technology but in a lot of cases it is about data. It is about getting data from your manufacturing facility, interrogating that and understanding when those manufacturing facilities work best.

We have a package called Discovery 4.0 around that which is essentially to go in to observe what they are doing, to make recommendations, and to literally draw out the road map. That road map has a cost to it, and

that initial cost for companies is something that they often have a difficulty with. I was listening with interest to some of the grants that I was not aware of mentioned by the previous panel, and certainly if some support could be made available to those customers that would allow them to subsidise our costs, and that would be of great benefit.

Q184 **Zarah Sultana:** You mentioned there are grants that you were not aware of until now. Were you able to receive any Government support over the past few years?

Stephen Malone: Over the last year we have had the furlough scheme. I was lobbying our local MP about the middle of last year to try to make it flexible and was delighted when that was agreed because it allowed it to restart from about July onwards. We have not received any other grant, and that is something I would ask the Committee to consider because there has been a lot of talk about FDI and how to attract FDI. In other countries we operate in, SMEs are incentivised to grow. If we grow as an SME in the UK, we are going to increase jobs and exports, and there are direct and indirect benefits from that. To my knowledge, there is no organisation in the UK that is tasked with helping SMEs grow.

Q185 **Zarah Sultana:** Stephen, you mentioned the decision to move from the north-west to the Midlands and you mentioned location, the customer base, the talent, and the world-class engineering. Have you seen a trend where companies are moving to the West Midlands and what can the West Midlands be doing to showcase some of those factors?

Stephen Malone: A couple of competitors have, so I do not think it should be doing anything at all.

Zarah Sultana: Okay, great. That is good to hear. Hopefully more will move and not necessarily competing with you but the more companies, the better.

Stephen Malone: I suppose on a serious note we now operate with people remotely working in all locations. We invested very heavily in a system a number of years ago and that has really paid dividends over the last year and a half. We have people working who would never see offices on a routine basis at all, and that was coming in anyway pre-pandemic. I think it is unlikely we will ever get back to having people in five days a week again. There are certain times in a project lifecycle where you need people in a room sharing ideas and then, when that bit is done, it is about getting on with it.

Q186 **Zarah Sultana:** Just on that, we have seen some companies trial four-day working weeks; is that something your organisation would consider?

Stephen Malone: I have been reading a little bit about that. We suggested a four and a half day working week a number of years ago and people did not take it up. We work in a business where there can be unsociable hours when we are installing and commissioning, and there has to be a lot of flexibility there anyway; there is a lot of inbuilt

flexibility in how we operate. I think it is one of our selling points as an SME against some bigger corporates when we are all fighting for staff. It is something I would like to talk about later on, but I think that inherent flexibility has always been there.

Q187 **Zarah Sultana:** Finally, to both of you. I will start with Tony. Do you think that the planned uplift in public R&D spending is enough, and can you see which ways industry and organisations that you work with will benefit from it?

Tony Kinsella: I think we all agree it is never enough. I am passionate about the split. I do think there is something to be corrected in that split. I think it is critical as we go forward that there is more on D than R. We need the invention but we need to develop it. We need to be back to that manufacturing industry that makes products.

I think there is something more pertinent as well, underlying it. I think our accountancy and our purchasing profession need to go back to school to understand costs and what is real value. Look at some of the things the Government struggled with in the supply chain. We can buy in PPE made in China, but if it is made in the UK, you get rates, you get rent, you get VAT, you get employment taxes, yet our buyers just look at the purchase price. That is a failing of the accounting industry and a failure of training in purchasing. That is something I think Government could help with. There needs to be a refocus on what is a beneficial purchase price that the NHS or any other Government institution should buy.

Zarah Sultana: Thank you. Stephen?

Stephen Malone: Just to follow on from that point, there is a phrase we are hearing quite a lot in recent months: "just in case" as opposed to "just in time". What if something happens again? I think every country in the world needs to challenge its supply chain. We cannot all get everything in the same continent. Also, with companies now becoming more and more focused on ESG, it is also a case of looking at the logistical costs of getting something from another part of the world and adding that. It is not only the pounds and pence; it is the carbon footprint as well. That is really important.

In terms of the grant, yes, absolutely, it is always nice to get more. We do not rely on grant aids so much because a lot of the research projects we do we would do on behalf of our customers. We do have some research ourselves that we kicked off in the liquid air energy space for which we will be looking for support, and we will be looking to Governments for support in the regions we operate in. That is a decision for next year.

Zarah Sultana: Thank you.

Chair: Thank you very much indeed, Zarah. Since we are talking about, at least in one case, in north Staffordshire I thought we should have one

of our members from north Staffordshire, Aaron Bell, before Rebecca Long-Bailey.

Q188 **Aaron Bell:** That is very kind, Chair, and thank you both for coming. If I could continue with Mr Malone on some of the general points first because obviously you work with a lot of companies. We heard a lot in that first session about the West Midlands being an outlier in terms of the public to private ratio. What is your experience as to why that is the case in the West Midlands, and do you think it is partly related to what Tony was talking about and what you have mentioned in your answer to Zarah, about bidding for things in the first place?

Stephen Malone: Our customer base is entirely private sector, and that is the space we work in. I am not sure I am in the best position to answer that question.

Q189 **Aaron Bell:** There is public sector money available for some of these businesses. Are they not aware of it, how to access it or what the MTC here does—things like that?

Stephen Malone: Yes, absolutely. It is not only our customers who are not aware of it; we are not really aware of it because it is unclear to me, having spent a decade working in the UK, where I can go to get that sort of information. We are aware of the MTC and we have been before now. There is an organisation in Ireland called Irish Manufacturing and Research, IMR, which is an MTC equivalent, and there is a relationship between the two organisations. Some of my team have been in here and have had conversations about a couple of different projects. But, yes, it would be great to be able to go to somebody to talk about our Discovery 4.0 programme and to say, "Here is a way of getting a contribution, a tax credit, or some other form of assistance."

Q190 **Aaron Bell:** The other general point I wanted to ask you about that came out of the first session was the point that all of the members of that panel made about the need for skills and talent and technical education, and so on. What has your experience been about the ability of the companies you consult for to access people with the right skills and the right talent?

Stephen Malone: I think this is a big, big challenge and it is facing all of us who operate here. The challenge I see, and this is I suppose a bit of a bugbear of mine, is when I went into college in the 1980s engineering was seen as a profession of choice. The word "engineer", in the UK and in other regions in Europe, isn't perfected. Anyone can call themselves an engineer. If I compare us with our colleagues in Canada, an engineer there is seen as being at the same level as a doctor or a solicitor. We have lost that here, and it is becoming increasingly difficult to attract school leavers into the world of engineering. If you look at what engineers do—again, to Tony's point—they have been involved in designing everything in the room, everything we use on a daily basis.

The designation of "chartered engineer" would not be in the public mindset. The reality is we, as a society, would not accept somebody

calling themselves a doctor who wasn't a doctor, or somebody calling themselves a solicitor who wasn't a solicitor. There is an urgent need, in my view, to protect the word "engineer" and to limit its use. Only that way are we going to attract bright school leavers into engineering.

I think this is such a serious problem for the industry that it needs to be addressed as a matter of urgency.

Q191 **Aaron Bell:** The previous Education Secretary, a Staffordshire MP, put a lot of emphasis on further education. We are now bringing in T-levels. Do you sense that this is changing slightly or—

Stephen Malone: No, I do not. You just have to listen to radio ads where titles are made up with the word "engineer" at the end of it. It is not seen as a profession of choice anymore. It was in my day. It was something to aspire to. If you read about a chief engineer or if you met a chief engineer you were nearly in awe. It is just a throwaway term—a disposable term—days.

Q192 **Aaron Bell:** Thank you. Tony, you were close earlier when you described Stoke-on-Trent as the centre of the universe; we all know it is Newcastle-under-Lyme. Thank you very much for coming, and thank you for all you do at Lucideon.

Now, if we could talk about some specific R&D projects. What were you working on before the pandemic struck? What were the most interesting cutting-edge things that Lucideon was working on then?

Tony Kinsella: Probably the most cutting-edge area was aerospace, looking at thermal barrier coatings and CMC—ceramic matrix composite—to make aero engines operate at ever higher temperatures, produce fewer emissions and get more miles per gallon of kerosene. That was a fascinating but important area. The other one was digitisation—computational materials development. We do an awful lot of experimentation and you will have seen some of that here at MTC. Starting to do that R&D in silico, as it were—in computer—to reduce the R&D time is a fascinating area. You can start to say, "Here are 8,000 potential combinations of a whole bunch of compounds", run it on a super computer for a week and end up with 20 or 30 real candidates in two weeks rather than three or four years of failed experimentation. That is quite exciting, I think.

Q193 **Aaron Bell:** What is the route to commercialisation for your company of these cutting edge things that you are researching?

Tony Kinsella: Yes, engagement with industry and product managers. It is personal, yes. You can do everything with the web that you want but we are pack animals, as humans, aren't we, and in the end you have to engage with humans—I had Kwasi Kwarteng up there a couple of months ago—and commercial technocrats. We have some great scientists and it will be the same here in MTC. They can talk science all day long, but to be able to translate that and put it in the mind of a business leader so

that they can adopt it somehow, with all the technical skills, is something we need not to be embarrassed about. We should be excited to add that commercial aspect to our technocrats. Then we will go out and take that technology from the lab and that excitement on to the factory floor.

Q194 **Aaron Bell:** Then, during the pandemic, I understand your company stepped up in a couple of scientific areas to support the national response to the pandemic. Can you talk us through those?

Tony Kinsella: Yes, we did. Here we are talking about ceramics, but we were deeply involved with work on the vaccine; we did all the work on the buffer and the control medium. That was a great programme in terms of helping the nation and ourselves. We were really pleased to be able to engage in that, so that was critical. Some of the parts in the ventilators are made of ceramic. They were made outside the UK, and there has to be a programme using West Midlands firms to re-engineer those and make them here in the UK.

Q195 **Aaron Bell:** How was your experience? Were you asked to help? Did you stick your hand up to help and did you get the right support from the Government?

Tony Kinsella: Yes, I think on all things we stuck our hands up. I am always nosey and pushy, so we offered to help. I think we were asked in on a couple of areas and we certainly got support. If I were to be critical of one thing, I guess I would say I support everything that happened in the pandemic except the blank message, "Stay at home and work from home". You cannot have an engineering business with people sat at home. It does not work. That message is still prevailing.

In a business where you have administration and other functions and R&D, you are creating two tribes: the work from homers and those who have to work in the lab or in the R&D facility. I think we have to be very careful what we talk about because if we want this to be a great manufacturing nation, yes, we can automate it but you still have to have people in business around machines and machine tools. We have to be careful what we wish for, I think.

Q196 **Aaron Bell:** Where has your company got to now? Is everyone back in the office all the time?

Tony Kinsella: We are all back at work now. I was on a session this morning and was fascinated to see out of 25 CEOs I was the only one in the office. Everyone else is at home. That is not about martyrdom but I am not sure that leadership is great from behind. It sounds like the First World War in the Somme to send people over the top rather than being there at the front. I think it is all about having the right procedures in your business so people are safe.

Q197 **Aaron Bell:** Finally, Tony, we are conducting a parallel inquiry into hydrogen and I am aware that you are looking at using hydrogen as a firing gas in ceramics. We obviously know that the ceramics and the steel

industry are suffering quite badly at the moment from the high energy prices. I think there was a PMQ about it yesterday from Holly Mumby-Croft. Could you tell us a little about that testing of hydrogen and what role you see hydrogen playing in the future of ceramics?

Tony Kinsella: Yes. We have invested in the equipment, and in a couple of weeks we will have a kiln coming in that can take up to 20% hydrogen and then blend up to 100%, and we have a great programme now with HyDeploy and Cadent to actually trial that. We have to look not only at the functional performance of the product after it is tried with hydrogen. If you change the atmosphere in that kiln and the product does not bake the same, you have to think about whether it will still be as brittle or will it be more brittle. Will it be as strong? You also have to think on the fashion side. Will it develop the colour?

We are right at the front edge on that now, and the next investment is to say, "What does that look like on a larger scale for the big users of industry, the tyre manufacturers and the brick manufacturers—the very large volumes of gas in there?" We are deeply involved in understanding the impact, both economic and technical, on the product.

Q198 **Aaron Bell:** It is still something of an experimental stage at the moment?

Tony Kinsella: Yes, it is. It is unknown in many areas. You can actually work out the work energy of hydrogen versus natural gas, but at the atmospheric side, in terms of the furnace, that is still quite uncertain. There is quite lot of work to be done over the next 18 months to show that you can get the same product out for the same work energy in.

Aaron Bell: Thank you very much, Tony.

Q199 **Rebecca Long Bailey:** Just to elaborate a little bit more on that, Tony, one of the big concerns over the last few months in the ceramics industry have been energy prices and the fact that they are potentially going to get a lot worse over the winter months. What do you think the Government should be doing to support the ceramics industry? Of course, it is not just the ceramics industry it is the construction industry, cement manufacturing, anything that uses a high amount of energy.

Tony Kinsella: Yes, I guess we all have a problem around the world in terms of energy prices. I think some of the industry has bought forward, so it has protected itself and that is partly what we are bound to do ourselves as industry leaders. Part of the HyDeploy programme is to say, "What other sources of energy can be used?" I think that is critical. Also, to look at some of the technologies, when Greg was Minister we had an award to look at an exciting new technology, in terms of sintering, which could sinter in one minute what normally takes 40 minutes. It is 30% less temperature.

There has been investment but there has to be the other side, the adoption. When I talk about industry, sometimes we can be quite slow. I

go around the world, as I said earlier, and I talk to CEOs in the UK and we get the: "Are we first, Tony?" That is a quite timid, "Surely lots of other people have been there first." I go to America and it is, "Are we first, Buddy?" which means, "I want to be the first mover". That is a cultural thing and I think we have to get much more of that in industry.

Q200 **Rebecca Long Bailey:** Yes, definitely. One other question was: you obviously have a footprint in many different regions across the UK. You understand what is happening in the various areas. Would you say that there was a vast difference between the types of support that are available in particular regions and are there any specific regions you would say that were streets ahead of the rest that we should be trying to replicate across the UK?

Tony Kinsella: No. From my experience, I think it is more about the local government and the local LEP and how engaged they are to help industry. I think the support seems pretty much—I was going to say—margarine-like. That sounds disrespectful, but I think it is about engaging in helping people to be able to make best use of it. There are areas where I think you need to get back to the clusters and invest so that you can bring all that FDI through on that cluster base.

Q201 **Rebecca Long Bailey:** Stephen, the same question to you. Are there any things that you have picked up when you have been in different regions in the UK that you think would be good for the Government to try to roll out across the whole country?

Stephen Malone: We look at it more on an industry basis, so we are in a position where we are able to take what we see in the pharmaceutical business, what we see in the food and beverage business and cross-replicate that over different industries.

I would just like to pick up on one thing that Tony said. I can give an example of where a British company is pioneering in a certain space at the moment. We have an agreement with a Canadian company for some carbon capture technology. It takes carbon from fuel stacks and puts it through biophoton reactors and grows algae. There is a major food company in England at the moment that is trialling one of these. It is in detailed design at the moment. It is pioneering technology because it is a circular process. It takes CO_2 out of a stack, cleans it, sends O_2 to the atmosphere and then you have an outtake of algae that can be used as a superfood. That can be used for animal nutrition and can be used for other applications as well. We are very excited about this.

There was a lot of talk in the previous panel about new tech, which is absolutely great but there is also a huge opportunity. We are here talking about a Covid recovery and this is a huge opportunity for the UK Government and for all Governments to invest in. I think what is going to be needed over the next few years is for Governments to take a punt on some of this new technology that is out there and to facilitate investment.

Q202 **Rebecca Long Bailey:** Is there anything that you have seen in the countries that you have a footprint in? I think you mentioned Canada and Belgium.

Stephen Malone: Bulgaria.

Rebecca Long Bailey: Are their Governments doing anything specific beyond what the UK Government are doing to support that R&D?

Stephen Malone: I mentioned earlier about other countries that would more proactively support SMEs and that is one area that I think could be looked at. It is great to be invited to give my views on a panel like this. This has not happened in other countries, so I do greatly appreciate that. It is strange—without naming names—that there have been some countries I have been in recently that you would not think there is a crisis at all. I think on the back of COP there is such an opportunity here.

I remember being in Washington DC in 2019 at an investment conference. It was such a relief at the time to get away from conversations about Brexit for a week, and I thought at that point, "Everything is passing us by. We are so entrenched in this conversation. There is no room for any conversation about anything else and this is the opportunity". Think of all of the commitments that have been made under COP. Now this is the opportunity for Governments who choose to run with it and I certainly think, on the carbon capture technology I have spoken about, there is a huge opportunity.

Q203 **Rebecca Long Bailey:** In terms of that green industrial strategy, what are your thoughts on the Government's net zero strategy? Do you think it is detailed enough? Would it spur on investment in the areas of project delivery that you are working on at the moment or do you think there needs to be more put on the table? There have certainly been widespread criticisms, for example, that there just isn't enough money put in there to meet the criteria that have been set.

Stephen Malone: I have not seen very much meat on the bones of it, to be honest with you, Rebecca, but it all goes back to Governments taking a chance and saying, "If you are looking for proven technology in order to address all the problems we know are out there, we are going to be waiting a long time". Someone has to be the early adopter.

The company we are working with, a company called Pond Technologies, in Markham, Ontario, have some interesting tech around this. We are working with two projects at the moment, two pilot projects, one here and one in Calgary.

Rebecca Long Bailey: Thank you very much. Tony?

Tony Kinsella: On net zero, I have been in general management for 30-odd years and I have seen all forms of green wash come across from industry. I have never ever seen so much real passion about climate change industrially. It has been a marked and fascinating change. I think

Government funding is, yes, important but actually getting people truly involved in the mission for more than green wash is also important. A COO of one of the major ceramics companies used to tell me, "Oh, forget energy, Tony. We just put the price up". That was his response to climate change. Now they say, "Only talk to me about sustainability. Nothing else, just about sustainability". That to me is the lever against the Government fund, isn't it, that is needed to pull through?

Rebecca Long Bailey: Yes. Thank you.

Chair: Thank you very much indeed, Rebecca, and finally to Carol Monaghan.

Q204 **Carol Monaghan:** Stephen, I want to ask you a couple of questions. First, thank you for the comments you made about engineering. I have shouted about this on many an occasion. An engineer in our speak can be anything from someone that fixes your telly to tinkering about in your car and they are always definitely male. I have a huge issue with the nature of what an engineer is and I think we have to do a lot of work on that, so thank you for that.

Stephen Malone: I would agree. I think getting young ladies into STEM has to be a priority.

Q205 **Carol Monaghan:** Absolutely. It was interesting to hear your comments about funding and saying that you had found out today about areas of funding you could tap into. We had the tour this morning and one of the things we heard was that innovate funding or innovate funds from the UK Government cannot be used for advertising, so we are relying on what we heard in the previous panel, for example, a bank suggesting that companies go and talk to something like the MTC. Would you like to see more advertising or promotion of, for example, schemes like this, and how do you think that would be best done?

Stephen Malone: I would essentially like to see a body who was tasked with helping SMEs grow and provide support around that. That does not always need to be financial support. That can be advice and guidance. We have applied for an Innovate grant on behalf of a customer. That is pending. It is in the vertical farming space. I suppose a lot of the talk has been around the manufacturing industry and making it more future proofed. In the service sector it is a different proposition.

Q206 **Carol Monaghan:** I was not thinking so much of the innovate funding you have but I was thinking more of, for example, the innovate funding that MTC has and not necessarily should they be able to use that for advertising but should there be more promotion of these kinds of collaborations between something like MTC and small businesses? Should there be something that would alert you? That may be exactly what you are talking about.

Stephen Malone: In terms of advertising, yes. It is a different way of doing it. Just going back to another country that we are operating in, that

model works well where there is an organisation tasked with supporting SMEs.

Q207 **Carol Monaghan:** Where is that?

Stephen Malone: Ireland.

Carol Monaghan: Ireland. Okay. Thank you. Thank you, Chair.

Chair: Thank you very much indeed, Carol. Can I thank Stephen Malone and Tony Kinsella for giving us the benefit of your practical experience? We have talked a lot in the first session about future developments, future discoveries. One of the things that came strongly out of that was the need to apply not just breakthroughs but actually the current levels of technology and to disseminate that. It is very good to hear from you about your experiences and your thoughts as to how that might be done for the better. Thank you very much indeed for coming to the MTC to appear before us today.

Examination of witnesses

Witnesses: Professor Martin Freer and Professor Daniel Smith.

Q208 **Chair:** I am going to invite our next and final panel of witnesses to come to the table. Thank you very much. While they are joining us I will introduce them. I am delighted to welcome Professor Martin Freer. Professor Freer is a nuclear physicist by background but, particularly for our discussion today, is director of the Energy Research Accelerator and also director of the Birmingham Energy Institute at the University of Birmingham. Also Professor Daniel Smith. Professor Smith is the executive director for global cell and gene therapy at Cobra Biologics, and is honorary professor at both the University of Kent and, more particularly for our purposes, the University of Warwick and has a PhD in molecular cell biology earlier in his career.

Perhaps I could start with Professor Freer first. Obviously, one of the themes of our discussion today has been to look at the strengths, the opportunities but also some of the things that have held the West Midlands back, according to its potential. You are involved in an area of work that has national implications but you are very much rooted in the West Midlands, so can you tell us about the experience of that, and perhaps in so doing just describe a bit about the work of the Energy Research Accelerator.

Professor Freer: Thank you very much for the opportunity to join you here today. The Energy Research Accelerator is not just focused in the West Midlands. It brings together eight universities across the whole of the Midlands and collectively it is about 1,500 people working on energy R&D. It works with all sorts of organisations, so the British Geological Survey is part of our membership. We have worked with the West Midlands Combined Authority. We have worked with the Midlands Engine,

so we work at a political level but, primarily, our job is to try to accelerate energy technologies in the broadest sense, reaching out into sustainability and transport into market as fast as we can go.

It is working with large businesses, so OEMs, multinationals, all the way down to small businesses. Our programme has supported about 1,000 SMEs across the region in developing their own technologies, originally funded through Government: £60 million-worth of Government funding, which leveraged about £110 million of industry funding. Indeed, overall, it delivered in five years a programme of about £450 million of activity back into the West Midlands and East Midlands region, by attracting in other investment.

I would say it is a successful programme, which at the moment is driving a number of initiatives. One of them is around how we deliver hydrogen, freight and logistics across the Midlands, so how is it that we can get 44 tonne hydrogen trucks on the roads? How is it that we can take advantage of the fact that the Midlands has some industrial strength? So, around heating, energy, and recognising some of the national challenges that we have, particularly around decarbonising heat, that we have many of the assets that we need in the region to drive this sector forward. At the moment, we are proposing a national centre for decarbonisation and heat, which would be anchored in the Midlands.

Q209 **Chair:** Just about the word "accelerate" what does that mean to the layman?

Professor Freer: Accelerate, in terms of timescale, is what it means. You think about development of energy technologies from inception, so let's take the university as a microcosm of that. You have academics who are developing new ways of doing things, driving innovation, and then you have to go from early stage funding, which is typically coming through research councils like EPSRC, through to the point where you are scaling up, to the point where you are demonstrating, and then you are developing the manufacturing processes around technologies so that you can bring them through into market.

Our acceleration programme embeds facilities in universities. It takes them through to environments like—I think you heard about Tyseley Energy Park earlier on. Tyseley Energy Park is one of the five energy innovation zones that we have created across the West Midlands to house innovations. That is a real industrial setting where one is scaling up that technology and embedding it into an energy system. Then the MTC itself has played a very significant role in the manufacturing side of things, so I am going to guess you saw the factory in the box as you went around.

That was a £10 million programme that the Energy Research Accelerator funded. That was so that, as companies are developing their technologies, we have state of the art manufacturing that we can offer them through a range of not just a factory in a box but through a range of programmes that the MTC delivers.

The art is of course bringing a whole set of organisations together. You have the energy systems catapult in the region. You have the high value manufacturing catapult. You have the universities. The art is to get all of these organisations working ideally in a seamless way. Often innovation is lost in the gaps and the idea of the Energy Research Accelerator is there are no gaps, so you are handholding the technology development all the way through into market.

Q210 **Chair:** Thank you. As you point out, the Energy Research Accelerator is across the Midlands but why the Midlands? Is it just coincidence? Is there any particular reason that it should be in the Midlands or could it be in the north-east or the south-west for that matter?

Professor Freer: If you look at the energy sector itself, about one-third of the jobs associated with the energy sector are in the Midlands. We have companies like National Grid. If you think about the heat sector, Worcester Bosch, Baxi, Vaillant—many of the manufacturing companies are important in that sector. If you also think about where historically we got energy from, it was big coal power stations and a heck of a lot of them sat across the Midlands. We are going through a transition now. Not so far away from where Aaron is there is a coal power station, Rugeley, which is going through a transition with investment from a very significant company, ENGIE/EQUANS.

If you look in the East Midlands there is a whole series of sites there that also need to go through a transition, so we have a lot of the expertise, and a lot of the investment has come into this region. About £5 billion per year goes into the regional economy from the energy sector. It is very significant.

Q211 **Chair:** Thank you. There is an interesting feature of that. Clearly, you said the implication is that the accelerator has followed the footprint of an industry here. We have essentially found the same from ceramics in the previous session and, indeed, the Warwick Manufacturing Group had its origins in automotive, which is an interesting model as to how supportive research institutions might develop.

Before turning to my colleagues, perhaps I could turn to Professor Smith and just ask you to describe a bit about the work of Cobra Biologics and the role of the West Midlands in your business.

Professor Smith: Yes. Thank you, everyone. Thanks for inviting me here today. Cobra Biologics is a small company based on the Keele University Science and Innovation Park. It has been established for about 20-plus years there. It was established originally by people that worked for AstraZeneca in the north-west on the Macclesfield site and the Alderley Park site there, that wanted to do more biological-type work around medicines manufacturing that AstraZeneca wanted to do at that time, so they spun out a company, set it up at Keele and it has grown from that point onwards.

What is Cobra today? Cobra is a contract development and manufacturing organisation that makes early phase clinical trial material to support innovative medicines. We work primarily in the areas of cell and gene therapy. We make the medicines that are coming from our customers, which are trying to get into first-in-man studies, so we are highly regulated. We are inspected by the MHRA. We have, every two years, licence reviews to make sure our manufacturing facilities are up to scratch, our quality systems are up to scratch and everything like that.

Why the West Midlands? I think, first, it was a close location to where people lived when they spanned out of the original sites. However, it started as a therapeutic development company and acquired some technology from Birmingham University so, again, there was a link to the West Midlands at that point. I hear a lot about, "Why the West Midlands?" and we are talking about the West Midlands today. It is an interesting one in our sector because I see the UK as a cluster, I do not see different parts of the UK being separate.

In our organisation and in our sector we have to work very, very collaboratively with lots of different organisations, be that academia, other businesses, Government and things like that. Therefore being in the centre of the country is helpful from a location point of view, a transport point of view. Fundamentally, it could be anywhere.

Why the West Midlands? Historically the skill base around the West Midlands is also very important. Within the geographical location to where we are, are some of the really strong universities that support the skills we require within our business. We have Warwick, Birmingham and Aston and then further north we have Manchester, Leeds, Liverpool and Sheffield, which are all able to come in and work in the really confined area of what we want to do.

Q212 **Chair:** Thank you. Before I turn to my colleagues—starting with Aaron Bell and then Carol Monaghan—I will turn the question around the other way. We had the opening, I think it was yesterday, of the AstraZeneca headquarters research building in Cambridge. There has been, in life sciences generally, a kind of clustering effect in places like Cambridge and I suppose London. Have you felt a gravitational pull, which you have resisted, to join that? Are you exceptional to what we might hear about?

Professor Smith: I do not think we are exceptional. I do not think you have to be as clustered as that to do what we do. You have to be able to work collaboratively and you can do that down the road with someone else or you can do that at the other end of the country with someone.

Q213 **Chair:** You described the UK as being a relevant cluster?

Professor Smith: Yes.

Q214 **Aaron Bell:** Thank you very much, Chair, and thanks, both of you, for coming. I will continue with Professor Smith.

We have talked about the West Midlands. Perhaps you could give a little bit about what the specific advantages of Keele, the Science and Innovation Park, are for your company and, again, whether you have been able to get the necessary skills or whether it is the fact Staffordshire is so well located in terms of the logistical connections around the country. Why Keele? The innovation park has grown so much in the time you have been there, you were one of the first tenants. Could you talk a little bit about that as well?

Professor Smith: Yes. Keele has been a very good landlord and a very good host for our company. We started off taking a little bit of space in one of their existing buildings. Half the building was a telephone exchange and a library and the other half was some research labs that we started off working in. Slowly we have been able to grow the business and take over the whole of that building. Five years ago now we needed to expand even further. Keele is very, very ambitious in the way it builds its innovation centres, allows companies in to access space there as well. It was a very natural fit to expand and to continue to expand in the same location, take more space on the campus and things.

To answer your question on the skills, the workforce around Keele is very, very loyal. They are great people to work with. There are about 120 people on the site in our company and I would say 30-plus of those have been there 15 to 20 years. They really stay, they are really loyal. You train people really well and they stay. They love coming into work.

We will probably touch on the pandemic later on this but one of my real pleasures, I guess, with the pandemic was the fact that we were able to do what we did. No one was put on furlough. People worked at home and people came in. Even the loyalty of people who have administration jobs, being at home they would ring me at home and be really grateful they worked for a company that was able to do something to respond to the pandemic. That is loyalty.

Q215 **Aaron Bell:** That is what I was going to ask you next because you did not cover it before. I am aware what you did with the vaccine was not your core business but you reacted very quickly. Perhaps you could talk us through your role in the AstraZeneca vaccine. In fact, you were involved with it before it was even the AstraZeneca vaccine.

Professor Smith: Absolutely right. I have just come from a conference where we have been talking about this.

I was contacted on 23 February by a person called Dr Sandy Douglas from the University of Oxford at the Jenner Institute. He rang me and said, "I've been given your name because I believe maybe your company has the skills that can help us scale up our vaccine from where it is in the lab and to help us make the first doses to put into phase 3 trials for patients". I said, "Maybe we might be able to do that". It took 109 days from that point—to work with Oxford, to work with Pall Life Sciences based in Portsmouth, to work with Symbiosis, which is Finnish company

based in Stirling in Scotland—to scale it from a 3 litre scale reactor, as it was then, up to a 200 litre scale reactor. In 109 days to make it, test it and get it out for clinical trials was a phenomenal effort.

Yes, we were in before AstraZeneca joined. We were working directly with the University of Oxford and the scale-up team there. As AstraZeneca came in, it transitioned from Oxford to AZ and then we continued to work with AZ. I was seconded into the University of Oxford team to support the transfer of the process, not only into the Keele facility but also into the Oxford biomedical facility in the UK and to the Helix facility in London as well.

Everyone put their hands up and stepped in to do that. That is another really important point. We have heard a lot today about the manufacturing that goes on here. The life science sector that we work in is a great place to work, it is phenomenal. What motivates me every morning is that I can go to work and what I do can fundamentally change the lives of patients. I think everyone at Keele believes that. Everyone at Cobra believes that they are contributing to future medicines, potentially life-saving medicines and life-changing cures for people as well.

Q216 **Aaron Bell:** First, we are all incredibly grateful for the work you did. I was very grateful, you gave me a tour on 1 April, maybe, in 2020 and I was staggered by how far you had come so quickly.

What lessons has your business learned from that experience, how will that support your growth in the future and how will that support the region's recovery from Covid?

Professor Smith: This is an interesting concept. Why were we able to do what we did as an organisation and as a consortia as quickly as we did? It came down to the fact there was a common purpose, everyone had a common purpose to do this and there was collaboration. There was absolute trust and collaboration between the partners that came together to do this.

The learning from this, Aaron, is how do we work collaboratively with competitors, with some suppliers, with Government, with academia and with the regulator, the MHRA, to move medicines quickly through to patients. It is not in a pandemic situation, in which we all know we need it as quickly as possible, but is how we make that the normal way of business.

I think it comes down to communication. Also, we are a highly regulated industry and there is a lot of checks and balances, rightly so, for medicines' development. However, you can innovate and challenge people's perceptions slightly on how to do those business processes without cutting any corners and still ensuring patient safety and medicine safety as well. For me, that is what it has been about.

Q217 **Aaron Bell:** In terms of future growth of the business and recruiting people, has the role in the pandemic, both for you and the whole life

sciences sector, made it a more attractive place for people to work? Are you finding it easier to fill vacancies now you have had this starring role?

Professor Smith: We continued to recruit through the time as well, we had to take on more people rapidly, train people rapidly and do things.

It is an interesting one now. As people have come through Cobra, have been highly trained and have that skill set, their currency to move to other jobs is very high at the moment. Therefore, we are having bit of a challenge on recruitment. I was talking to a number of other people in the sector and recruitment is a massive challenge for the whole of the life science sector at the moment. The amount of medicines coming through the pipeline, the amount of clinical trials that go on, phase 1 studies progressing through to late phase and commercial manufacturing, mean we absolutely need to train, recruit and attract more people throughout the UK infrastructure to support the industry. It is tough at the moment.

Q218 **Aaron Bell:** Thank you very much, Daniel. I better turn to Martin. Nice to see you again, Professor Freer.

In our first panel we spoke a lot about how the West Midlands has the highest ratio of private to public investment in R&D. You are obviously one of the people who managed to get some public investment and leverage that into private investment. Tell us how you did that, tell us what lessons you have learned and what future public investment you might want.

Professor Freer: Thank you. How did we do it? I think it came at a time—we might be at that time again—a few years ago when the universities in the Midlands recognised that a lot of the leveraging investment was going to other parts of the country, in particular the Golden Triangle. It was the vice-chancellors of the universities within the region who decided there was a strategic opportunity to argue for investment, leveraging investment into the universities that then would be able to drive economic growth in the region. It was, at the time, a strategic investment through Government, through Innovate UK, into the region.

I think it was bit of a national experiment in some ways. Nothing like this had been done before, where you are harnessing the innovation strength within universities, the collaborative power they have with industry—there is a group of universities that work very strongly with industry—recognising that industry would co-invest.

As I say, there has been not just a measure but a very significant level of success we have had in creating new initiatives. Not too far away from here we have the UK Battery Industrialisation Centre, UKBIC, which was capitalised by the investment we made collaboratively with Jaguar Land Rover into battery manufacturing facilities. We came up with this concept of energy innovation zones within the West Midlands. Rugeley is an energy innovation zone. We have five energy innovation zones within the region, Tyseley Energy Park is another, Coventry and the Arden Cross

development around the Birmingham International Airport is another. Black Country, indeed, is another energy innovation zone. I think we have taken the region of the West Midlands, the focus here, on quite a significant journey in terms of investment.

However, these are strategic initiatives. You do not unlock £60 million-worth of funding through writing applications to research councils. If one wants to take advantage of the kind of collaborative spirit that industry universities and political organisations have in the region they need to be supported in a strategic way.

Q219 **Aaron Bell:** Thank you. You just explained some of the work you have already done. In terms of going forward, has anything about the pandemic changed what you are looking at or is it mostly stuff that needed doing anyway? To what extent do you think the projects you have will be self-sustaining commercially or are they going to require continual public support from the ERA?

Professor Freer: The pandemic has caused us quite a lot of thought and consideration. Of course, it presents opportunity. You have a region like the Midlands, in particular the West Midlands, which is thinking about how it reconfigures itself from an industrial perspective. Of course, the impact on the automotive sector has been significant. There are opportunities, recognising the industrial base we have around the automotive sector and transport. It is how you reconfigure that for net zero. Hydrogen transport may be one of those opportunities.

However, as I was saying, a big sector in the future is going to be low carbon heat. If you look at the manufacturing base we have, if you look at the companies—E.ON is a big energy company in the region—we have all of the assets to start a new industrial sector within the region that creates international investment and creates new opportunities for skills, jobs badly needed within the region.

What was your second question?

Aaron Bell: I asked whether you thought some of this stuff would be commercially viable without the ERA.

Professor Freer: We have a number of activities that have spawned commercial ventures. We have developed technologies. A big challenge we have around the energy system at the moment is energy storage. Highview—a company we have helped support developed and, in fact, the original technology idea came from our partnership—is a very large energy storage technology company. It is doing very well internationally. We have commercialised technologies within China. Within China we have installed, with an industry partner, 1.5 gigawatt hours of energy storage technology. That is the size of a nuclear power station. We are commercialising technologies. This is not, fundamentally, an R&D programme. The acceleration bit is, with industry partners, how we can get this out into being products in market.

We have also set up a business incubator. We are drawing businesses into our ecosystem so that they can work and accelerate their own development of technology, work in partnership with the academic expertise and use our facilities.

Q220 **Aaron Bell:** Finally, our first panel, Andy Street in particular, was explicit about the need to diversity our R&D across the area because of the auto-industrial race you just spoke about. Was the ERA conceived as a deliberate act of diversification? Are there other areas in which the Midlands, the West Midlands specifically, ought to be trying to diversify our R&D efforts into?

Professor Freer: I think when it was established it was recognising the pinnacle of academic strength that we have in terms of energy across the university partnership and also that industrial strength and that by investing you could capitalise those communities to work together. That is what has happened.

My other role is that I am vice-president, science and innovation within the Institute of Physics. I come from the Physics Department of the University of Birmingham. This emerging quantum technology—we have within our region an institute that is developing quantum sensors—is clearly a big opportunity for UK Plc to develop a technology area. One can see clustering businesses around the centres of excellence that we do have in the region, quantum would be one example.

Q221 **Aaron Bell:** Finally on that, I presume you are relatively excited about the prospect of ARIA and the potential for projects that could bid into ARIA.

Professor Freer: I think we are all waiting to find out what ARIA is. It certainly looks like a great opportunity to shape—if it genuinely does turn out to be blue skies thinking—an acceleration of blue skies thinking into emergent sectors. There is a number of areas that one could think might do well within ARIA. I am not sure in which direction it is going. Certainly, there are exciting things in the energy sector. Certainly, in the physics portfolio there are things like metamaterials, which might be the next cab off the rank, which follows quantum technology. There are some really exciting things that one could see fitting into that portfolio. From a personal level, I am still waiting to hear what on earth ARIA is.

Aaron Bell: Thank you both very much. Thanks for coming.

Q222 **Carol Monaghan:** Thank you. Thanks for joining us this afternoon. I wonder if you could both, maybe starting with Professor Smith, give us examples of projects or products your organisation is developing just now that might help the UK, and the region indeed, recover from Covid.

Professor Smith: Certainly. We are a contract development and manufacturing organisation. Fundamentally customers come to us to be able to make their medicine. We have to continually innovate and

develop processes for those types of medicines to be able to make them both at the right quantity and at the right quality.

We spend a lot of internal R&D thinking about how we can make our processes more productive, quicker and at lower cost; how we reduce the cost of goods within the process. We can do quite a lot internally but we work very collaboratively as well through various grant-type approaches. We use Innovate UK funding for collaborative R&D grants. We work on the Knowledge Transfer Partnerships as well with academia to be able to translate interesting technology directly from an academic setting into the company setting. We also then do what I will say is more the blue-skies type research by supporting case studentships for doctoral training as well within academia, in order to really understand the underpinning biology or the underpinning biochemical engineering needs in order to improve our processes.

Really everything is focused around productivity enhancement. Without just going bigger and bigger, how you make more from the same footprint, and then how do we reduce the cost and increase the speed to be able to do things. There are a number of projects with different universities throughout the UK and also abroad as well.

Q223 **Carol Monaghan:** Is there opportunity within that? Obviously we have seen over the last 18 months the need to be able to manufacture drugs and medicines here in the UK. Is there opportunity to exploit that further rather than the situation we have at the moment?

Professor Smith: Absolutely, there definitely should be. We have a fantastic ecosystem within the UK of academia and small companies developing novel medicines. We have bit of a challenge on the translation of those medicines from a pre-clinical to a clinical setting at the moment. The Government, through Innovate UK and research councils like the MRC and LifeArc, have started to help close that gap by funding viral vector translation centres and the hubs they have set up. They have put a lot of effort into collaborative R&D funding.

Is it enough? No, we need to keep going. We need to push harder on it. We need to really bring the engineering and that biochemical engineering skill sets and need to bear, which we have in the UK, to make processes better. There is a great ecosystem around funding and grants. Is it enough? It is never enough. We have to keep going with that.

Q224 **Carol Monaghan:** If you had additional funding, what would you use it to do?

Professor Smith: Companies in our sector, and our company specifically, would use it for innovation-type R&D, collaborative R&D, in order to drive better processes. If there were capital grants as well, we would use them to build smarter facilities to do things better as well.

Q225 **Carol Monaghan:** Scaling up as well?

Professor Smith: Scaling up, scaling out. It does not even have to get bigger, it just has to get smarter at the way it delivers the medicines as well. The Government have put funding in on capital grants as well. We received a capital grant from the Government, prior to the pandemic, which allowed us to increase our capacity at the Keele facility that was absolutely beneficial for making the AZ vaccine. We would not have been able to do the vaccine unless the Government had helped us increase that capacity just prior to the pandemic.

A lot has gone into the sector. Is it enough yet? No, it has to keep going. We need to be able to then move the dial a little bit. We have gone from early-stage academic and translated it through to clinical first-in-man studies. The bit that really adds value is how we retain the commercial manufacturing of medicines within the UK. Currently a lot of it goes abroad because it is cheaper and easier to do it abroad. Once you have sent it out you never get it back. Therefore, it is making sure the UK captures that manufacturing 'stickiness', as I refer to it, and then lock it down.

Q226 **Carol Monaghan:** We heard from one of the previous witnesses, it might have been this morning, about smart purchasing that had economic benefits for the whole area. Do you think we should be thinking more about smart investment as well that will bring about further economic benefits rather than just what is immediately obvious?

Professor Smith: I think that is absolutely right. We have to think in that way. We have to be creative about what we have. It came up with the earlier panel talking about resilience in the supply chain as well. We are absolutely beholden to a global supply chain for making medicines. Currently, when we were making the AstraZeneca vaccine, we were able to access that global supply chain because everyone was supporting pandemic response. People are still supporting pandemic response. We are no longer making the AstraZeneca vaccine at our scale, we cannot get the bags we need, the tubing sets we need, so the other medicines are moving backwards now.

I do not think it is right to onshore everything into the UK. We have to think about what the pinch points are globally and then try to set up solutions to those onshore.

Q227 **Carol Monaghan:** Thank you. Professor Freer, if I can come to you, it is good to see you and hear you talking about quantum possibilities. I know the University of Birmingham is particularly strong in this.

Can I ask you about products or projects you are working on that are going to aid the area's Covid recovery?

Professor Freer: If I stick with the energy side of things for a moment, I hope you see that what we do is create an ecosystem. We draw people in by networking, creating partnerships and so on.

My colleagues from the Institute of Physics—a bit of work we have done as part of my portfolio—have done a survey, and I am going to switch for a second and then I will come back to energy, of physics-orientated businesses. The things that emerged that impacted them through Covid—it is all pretty obvious and you have said some of these—is the demand from clients, disruption to supply chain and access to equipment. For companies that are innovating it is access to facilities that universities might be able to provide access to and the acceleration that causes or creates by being able to work in partnership with experts. That is really what we do.

We have been working with a thousand businesses across the region to try to accelerate their technology journey. Covid has impacted very significantly on that. Access to facilities; no, we could not do that. Access to expertise has been difficult. We are coming out of the back end of that now.

The way universities fund their work with businesses is through ERDF. Across the region there is about £15 million of support that goes into regional institutions and universities that are funding that direct business engagement. You will know we have come to the end of that ERDF programme. You will also know we do not quite know what is sitting next in terms of ways of funding access for business to the kinds of facilities we have within universities. There is a real danger that all of the capability that has been created in supporting businesses and the expertise will evaporate if there is not a seamless transition to support programmes in the future.

Also, the way these programmes are set up is often with targets. We are in a slightly perverse position at the moment that we cannot, within a certain part of the region, support businesses anymore on our programmes because we have hit our targets and we are told by the funder, "Sorry, you have hit your targets. You need now to deploy your programmes elsewhere", even though businesses are still queuing up to work with us. Therefore, how you structure programmes is very important as well.

Q228 **Carol Monaghan:** Let me get this straight, you have funding but you are only allowed to help a certain amount with that?

Professor Freer: We have programmes that have targets across all of the region and in part of our region we have hit our target. The demand has been colossal.

Q229 **Carol Monaghan:** Sorry, could you give me an example? What do you mean by that target?

Professor Freer: We are allowed to support so many businesses. It is not how much money we have to spend. You can work and support, let us call it, 100 businesses within a particular LEP region. Once you have hit that target then you need to move on and support other businesses.

It is obvious, isn't it? One needs a bit more flexibility on how you deploy these programmes so that you do not run into these kinds of issues where you are having to turn businesses away.

Q230 **Carol Monaghan:** Have you raised these issues with BEIS?

Professor Freer: ERDF is funded through whatever the Department is called now. It has been raised with the Ministry but not with BEIS.

Carol Monaghan: Thank you. Thank you, Chair.

Chair: Thank you very much indeed. That brings us to the end of our session here at the MTC. I would like to thank our two professors for ending our panel. We have covered a huge amount of ground, from looking at the impact of the pandemic to the more longstanding differences in the contribution of private sector versus public sector investment in research and development, what might be the reasons for that and what might be done about it, to having a deeper dive into some particular examples of how innovation and technology is practised.

We are very grateful to all our witnesses for helping us with our inquiry, in particular to the Manufacturing Technology Centre for being very generous in hosting us today.

That concludes this session of the Committee.