HOUSE OF COMMONS

Science and Technology Committee

Oral evidence: Pre-appointment hearing: Government's preferred candidate for the role of Chair of UK Research and Innovation (UKRI), HC 358

Wednesday 22 June 2021

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Watch the meeting

Members present: Greg Clark (Chair); Aaron Bell; Dawn Butler; Chris Clarkson; Katherine Fletcher; Mark Logan; Rebecca Long Bailey; Graham Stringer; Zarah Sultana.

Questions 1 - 75

Witness

I: Sir Andrew Mackenzie, Government's preferred candidate for the role of Chair, UK Research and Innovation (UKRI).

Examination of witness

Witness: Sir Andrew Mackenzie.

Q1 **Chair:** The Committee is now in session. This morning we are conducting a pre-appointment hearing for the Government's preferred candidate for the chair of UK Research and Innovation. That candidate is Sir Andrew Mackenzie, who is with us in the room. We are grateful, Sir Andrew, for your joining us today. We have had a few technical problems this morning, so thank you for bearing with us.

Perhaps I could start with an introductory question before going to my colleagues. Why did you apply for the role?

Sir Andrew Mackenzie: Many people whom I respect encouraged me to apply for the role. Of course, that meant I had to spend a bit of time understanding the role of UKRI within the UK and more globally. I concluded—and this is a little self-serving maybe—that this was perhaps one of the most powerful levers to deliver greater success on a number of dimensions for the United Kingdom for the long term.

Of course, with that possibility, I became very excited and interested, and I felt as well that it was a reasonable match to my own career history and skillset. I started my professional life as a researcher, initially in the public sectors, not just here but in France and Germany—we can talk more about that, if you like—but then I went into industry where I worked in research and development and continued to publish for the first 10 years of my career.

During that time, I was able to see, through the success we had in the research that I did, many of the things that I think are important for UKRI to become even more successful at creating the great British companies of the future that will contribute to the kind of success that I referred to in the earlier part of my answer.

We ran start-ups. We saw other companies grow as a result of the equipment that we created, many of them British, and then when I joined BP I was able to put a lot of the better understanding to work to greatly improve the success of oil and gas finding for BP, which was a foundation that led to the substantial increase in the scale of BP relative to some of the other oil companies around the world and therefore a great boon to the UK.

I see analogies with this in all the sectors as we go forward as to how you bring the whole innovation ecosystem together to do what I think is generally a very positive thing for the UK. UKRI feels to me right at the nexus of this in an area where, because of my part-academic, part-R&D, part-industrial base but also links to finance, it appeals to my interests and my experience.

Chair: Thank you for that. We are going to go into some details, starting with Aaron Bell and then Rebecca Long Bailey.

Q2 **Aaron Bell:** Thank you very much, Chair. Thank you, Sir Andrew. Could you set out in a little more detail some of your research and development experience to date, including your personal experience, as you said, at the start of your career and how you enabled more research and development when you were further up and more senior at Shell and BP?

Sir Andrew Mackenzie: Certainly. My first degree is in geology, but it had chemistry as its No. 2 subject. I could not quite decide whether I wanted to be a geologist or a chemist, so having got a first degree in geology I decided to do my PhD in organic chemistry, but it was organic chemistry of petroleum. Mr Stringer and I had a conversation when we were offline about looking for the remains of molecules—we call them chemical fossils—that you will all know, things like cholesterol and chlorophyll, some things that are a little more esoteric, and, given that oil is a product of dead organic matter, seeing if we could find them in oil—and we could. That was very exciting. We did a lot of work in understanding how cholesterol got to the form in which it showed up in a very unambiguous way in a sample of crude oil or other forms of petroleum.

The more exciting thing for me beyond that, which took me more back to geology, was that that meant we were able to understand where oils had come from, what kind of rocks they had come from, and what the temperature history of those rocks was as they were buried over millions of years. That pinned down how oil was made and therefore changed the way in which we explored for oil. That, combined with much higher resolution seismic, made a step difference to the risk of doing that, and BP was in the vanguard in the way that I have described.

It got better still, though, because we realised that many of the molecular reactions that occurred in geology in the rocks to these types of molecules had particularly specific reaction kinetics, and we could use those reaction kinetics to determine the burial history of sediments in big sedimentary basins where you form oil and other things as well.

That led, particularly in my research career working with Cambridge, to constraining some very powerful new ideas as to how sedimentary basins are developed, which, as it continued, led to some deep forces in the Earth—I am talking hundreds of kilometres down in the mantle—that were driving convection cells and so on, and pulling the crusts apart. After plate tectonics, the study of continental deformation has been one of the more revolutionary ideas in geology as a consequence of that.

I did most of that work before I joined BP. After I left Bristol, I did a postdoctoral fellowship from the Natural Environment Research Council, and I worked with the British Geological Survey on how this affected the North sea.

I then went over to Germany and worked at the Technische Hochschule in Aachen, which is an interesting case of how the Germans do innovation, which we may come back to, which was much more related to

working on the development of the equipment, better gas chromatographs, better mass spectrometers and so on.

While I was doing my PhD, I did a lot of collaboration with the Institut Français du Pétrole. It was working with them that really defined the window in which oil and gas were formed.

Finally, I did work on sedimentary basins with the University of Cambridge. I continued to live in Germany, but I worked with them and some of the big names there in Earth sciences.

I thought that I would return to the UK in 1982 and take up an academic post, but I could not get a job, apart from one that was on soft money, which meant that I could not get a full-time job in academia. I am from Scotland. My dad said, "You've got to get a real job—none of this soft money rubbish," so I took a job with BP and joined their R&D department.

When I continued through BP I never really lost my connection with science. I spent quite a bit of time going to Indonesia and Norway looking for oil and gas, doing the broader piece of exploration geology, not just the chemical techniques that I had helped to develop with others. I worked on a lot of the ways in which we developed the North sea. For example, late in my career I brought in gas reinjection, which was something that had not really been used in the North sea before, to substantially improve the recovery factors of some of the major fields in the North sea.

Aaron Bell: Can I just cut in?

Chair: We will go into a bit more detail in questions from Aaron.

Sir Andrew Mackenzie: Okay, fair enough.

Q3 **Aaron Bell:** As CEO of the various companies you have been at—you have set out in great detail your own personal career—could you give an example or two of how you have championed R&D within those companies when you were in senior leadership positions?

Sir Andrew Mackenzie: To some extent it is an extension of my answer. By the time it came to getting some of the ideas of improved oil and gas recovery, I was already the chief reservoir engineer of BP. Therefore, I championed the use of what I would call novel technology in enhanced oil recovery in that position.

I should say that, just before I did that job and after I had been doing more business and financial stuff, I was in charge of all of the technology for specialty and basic chemicals for BP. I moved more into the petrochemical side. During that time, I championed a lot of work that was related to, first of all, developing new catalysts for the production of acetic acid. Its main use is to make vinyl acetate, which is the principal constituent of many emulsion plates.

I also championed research at that time to move away from oil-based solvents in gloss paints, working between BP and ExxonMobil in that kind of role. I had at that time about 300 or 400 researchers reporting to me. I picked these sorts of things out. I am particularly proud of the way in which we changed the catalyst system for acetic acid because it propelled BP to being a market leader in that.

Again, offline, Mr Stringer and I had a bit of a conversation about some other work I did in plastics. Right to the very end of my full-time career, if I jump ahead to BHP, I substantially increased the investment in trying to understand many of the geological systems and the imaging qualities that we need to find more minerals, and I drew the analogy and the success of the way in which we had improved our techniques for exploring for and developing oil and gas.

Q4 **Aaron Bell:** Thank you, Sir Andrew. In response to the questions the Committee sent you, you identified that you would need to acquire skills to work across Government. Could you elaborate on what you mean by this and how you intend to do that in the job?

Sir Andrew Mackenzie: Okay. Obviously, I feel reasonably confident in my ability to work across industry large and small. In what hopefully I have laid out I am reasonably comfortable and I have maintained strong links with the UK academic community. That side of things, I am sure, with the help of UKRI staff I will do well.

As a very senior industrial leader, I have worked—and I mentioned that in my answers—with many politicians of all persuasions in many Governments around the world because of my reasonably international career, so I am very comfortable, hopefully, with talking to people who have to subject themselves to elections like you and how that works.

Because of the way in which I got to the top, I probably have had much less exposure to what we would call civil servants. I have tended to deal with the broad picture things with Prime Ministers, senior politicians and MPs. I will have to work quite hard at getting to know their ways of working and learning about that.

In the middle of my career, as good fortune—I do not remember much of this—I was sent off by BP to join a senior leaders' course lasting four weeks run for high-performance civil servants who were expected to get to the level of permanent secretary, and I spent a month with them. I had huge admiration for the jobs they do. I maintained friendships with them, but not for any business reasons or some of the things you inferred.

I look forward to it. I must say I look forward to getting to know all of you on this Committee. Clearly, I would expect that you would want me to come back and try to understand concerns or questions that you might have. I see that, by the way, as a great opportunity and a great chance for me to learn more. I will do that, I hope, in a humble way.

Q5 **Aaron Bell:** Thank you. You think you will just essentially pick that up as you go along. There is not any obvious training you can do. You will just learn from what you already know.

Sir Andrew Mackenzie: I might be a bit more structured than that. I have already identified some reasonably senior people in BEIS and in the Treasury in particular. I would expect them to sit down more formally and explain how these things work rather than just waiting to do the training.

Q6 **Aaron Bell:** Thank you, Sir Andrew. Right at the beginning, when you were asked why you applied, you said you were encouraged. In your answer to us, you said specifically that many people across academia, on the UKRI board, in industry and Government all encouraged you to apply. For the record, could I ask you whether any Minister approached you to apply for the role?

Sir Andrew Mackenzie: No Minister approached me to apply for the role, but I was encouraged by some of the staff at No. 10.

Aaron Bell: Thank you very much. Thank you, Chair.

Q7 **Chair:** Thank you very much indeed. In terms of your answers to Aaron's questions, chair of UKRI is quite a big job, and you have pointed out a lot of the responsibilities that it entails. What sort of time commitment have you been told to expect from it, and what would you expect to commit to?

Sir Andrew Mackenzie: The blurb that they sent me to say, "Would you like to apply?" said a day a week. I think that is an underestimate. It is more like two days a week, and I am up for that. My equivalent blurb for being chair of Shell says two days a week. I think that is a little bit of an underestimate. I am up for working a five-day week. Look, I enjoy working. I work remotely and evenings and weekends. It is not a problem.

Q8 **Chair:** You expect that the demands might require two days a week.

Sir Andrew Mackenzie: I do, actually.

Q9 **Chair:** But, contractually, it would be a day a week. It would not be that you would want to or need to renegotiate the contract.

Sir Andrew Mackenzie: No.

Q10 **Chair:** What you are saying is that you would work—

Sir Andrew Mackenzie: No, I will work for a day a week's salary. Absolutely. It is not a problem. It is fascinating. I am very clear of the division between a non-executive chairman and an executive CEO. In industry, we are very strong on that. It is perhaps a little more blurred from what I can see here at UKRI and maybe in Government bodies. None the less, a very important part of my role is to empower, develop and inspire the executive staff of UKRI—not to do their jobs.

Chair: Thank you very much indeed. I will turn to Rebecca Long Bailey.

Q11 **Rebecca Long Bailey:** Thank you, Chair. Thank you, Sir Andrew. You clearly have a wealth of experience. Could you provide some comfort to the Committee regarding potential conflicts of interest? You have said that you do not think your role as chair of Shell, a non-exec director role, is a conflict of interest, but, as you may know, section 172 of the Companies Act 2006 states that directors have a duty to act in a way that promotes success of the company for the benefit of shareholders. That is a very clear overriding duty. On the other hand, your role at UKRI will require you to work with the CEO of UKRI to advise the Secretary of State for BEIS on major strategic investment priorities.

How do you propose to comply with both duties while also avoiding allegations that the work you are carrying out for UKRI or the advice that you give to the Secretary of State for BEIS is biased towards the business interests of Shell? One example that I can think of that might come up—and it is certainly part of Shell's long-term plan—will be investment priorities in hydrogen, which is a topic of hot debate at the moment.

Sir Andrew Mackenzie: That is a very fair and legitimate question, Ms Long Bailey. I regard that as something that has to be managed very carefully and very seriously—and I think I can. I have a lot of experience in my life of managing these conflicts of interest, particularly when it comes to board level and the different accountabilities of a non-executive and an executive. Inevitably, if you are going to put together a valuable board, you will end up with people on that board who in some respects may be a little bit conflicted. That is part of their benefit, which I will come to, but it is also part of the downside, and that has to be managed with real care. If there are decisions that create a conflict—of course there can't be too many—they have to be recused and removed from any decisions. I would hope that that release valve, if you like, would exist both at UKRI and at Shell. It does.

I do not think there will be many, because, as I said, the Shell model, and one that I am very strongly in favour of, is that the CEO of Shell speaks for the company and runs the company. The chair runs the board and, from time to time, will speak to the board issues but mainly at the high level of certain shareholder issues and the appointment of the CEO. Here in the UK, I would expect all representation to be handled from the CEO downwards and almost not involve me.

I would expect that in all my interactions with Ministers here in the UK I will do that wearing a UKRI hat and not a Shell hat, because I will be counting on Ben van Beurden as the CEO of Shell, and Sinead Lynch, who is the country chair of the UK, to do all of these things. I will be extremely vigilant about that to the point that I would expect that in anything as critical as you described there would have to be other members present, not just me, an individual, who would be able to vouch both at the time and subsequently for my independence.

That said—I will come to hydrogen in a moment—of course the whole basis of trying to make UKRI a success is to make sure there is joint working between Government, academia and industry. Being able to straddle these things with some of the conflict risks has some benefits as well.

On hydrogen—we can get back to Shell, if you like—Shell is very committed to being a real leader in the move to net zero, of which hydrogen is a very important part. I would expect—I cannot speak for the board; the decisions have yet to be made—that we are likely to make lots of investments in hydrogen because we see it as a very important part of getting to net zero. There are already three hydrogen filling stations in the UK. I know colleagues deeper into Shell will be advocating strongly that the UK is a leader in both the production of green hydrogen and blue hydrogen. You probably understand the differences.

I think we are on the same page in that sense, so there is not a conflict. Were one to exist, I would very much hope that it would never be something that I would be drawn into. I would leave that to the people in the detail of Shell working with people in government, and I would be wearing a UKRI hat and expect it to be that way.

Q12 **Rebecca Long Bailey:** Thanks, Sir Andrew. You will understand the reason that I am asking these questions. The obligation under the Companies Act is a very clear legal obligation to act for the benefit of shareholders.

You are very clear that conflicts of interest must be avoided, and I have no doubt that you will do everything you can to avoid any arising notwithstanding that legal obligation, which will cause a very considerable blur. You will know that UKRI has a specific policy for conflicts of interest, which states that board and council appointments are defined as roles with heightened risk in relation to perceived conflicts of interest.

There is a further section in the policy that states that financial conflicts of interest are defined as where an individual receives direct financial benefit from the consequences of awarding funding. Can you confirm if your role at Shell is a paid role? Do you receive an annual bonus of any kind? How do you propose to provide transparency that any research funding awarded by UKRI has not had an impact on any bonuses or salary that you might receive?

Sir Andrew Mackenzie: I do not receive a bonus, in line with good corporate governance. I simply receive a director and chairman's fee, which is fixed and is not changed in any way by the success and, I hope not, the failure of the company. I have no variable component to my pay. It is very different from being a CEO.

I appreciate very much your reminding me of these things. I am very thoughtful about the requirement for me to behave in a manner of the highest integrity, and I will study some of the documents that you have highlighted more carefully. I promise to comply. It is only right and

proper you should raise these things, and very understandable, so thank you.

Rebecca Long Bailey: Thanks, Sir Andrew.

Chair: Is that okay, Rebecca? Any further questions?

Rebecca Long Bailey: No, that is fine. Thanks, Chair.

Chair: Thanks very much indeed. Zarah Sultana.

Q13 **Zarah Sultana:** Thank you, Chair. Sir Andrew, you have spent your career occupying senior positions at BP, Rio Tinto and BHP Billiton, the largest mining, oil and gas companies in the world, before joining Shell as chair. Three of these companies are among the 20 most climate-polluting companies in the world. Last month, in a historic verdict, a Dutch court ruled that Royal Dutch Shell is liable for damaging the climate and was ordered to reduce its carbon emissions throughout its entire supply chain.

Based on that extensive history in the extractive industries, how can we have faith in you to head UKRI, which is responsible for the green innovation and research that is needed to address the greatest challenges facing the UK, especially climate change?

Sir Andrew Mackenzie: Okay. Ms Sultana, it is absolutely right and proper that you should ask me those questions. I am trying to think about how best to handle things.

The situation in oil and gas—so BP and Shell—is somewhat different from Rio Tinto and BHP. Let me deal with that side first. In BHP and Rio Tinto—and it is certainly true when I left BHP; I will explain that—the vast majority of the materials that we would be mining and producing are not fossil fuels. In fact, they are the reverse of fossils fuels in some sense because they are the metals that will be required for the movement to net zero: the steel for windmills; the copper for conducting more electricity; the nickel for batteries for electric vehicles; the potash to perhaps increase the carbon uptake of our soils.

While I was at Rio Tinto briefly, but certainly as CEO of BHP, I moved the strategy of that company to be part of the move towards a more renewable zero-carbon future by making sure, in the cleanest way possible, that we provided the metals and the materials needed to enable that. Going to renewables is quite a metals-intensive process, as you probably well understand.

While I was at BHP, I was very strong that we had to be a leader in the move to net zero. I led the commitment BHP made to report on and drive down our scope 3 emissions. Those are the emissions from our customers. In mining, it is even more dramatic than it is in oil and gas. If you look at the total emissions in the value chain coming out of a mining company like BHP, about 95% of them happen in the hands of our customers, not in the mines. We really have to influence those customer

emissions, which are known as scope 3. I was, at the time, the only mining company to do that. I made a big deal about it. I was criticised by many other mining companies. At the same time as I was doing that, I was repositioning the portfolio of BHP to be part of providing the materials that will be needed for a net zero world. Enough on that.

Turning to oil and gas, that, of course, is something I have rejoined more recently, although BHP had a small oil and gas arm as well, which is where the fossil fuel content would have come from, but it was less than 15% of the company. While I was at BP, you won't probably but some of the older Members will recall that BP took quite a strong stance. It was the first company to declare in the middle '90s that the activities of the company were unequivocally associated with global heating and something had to be done about it. The company then embarked on an agenda, many would say too slowly, but we were the first.

At the time that that was working, I was working in external affairs and I was part of the team that made that change. Of course, it was led and pioneered by John Browne at the time—now Lord Browne.

I decided to become the chair of Shell because I am very committed to getting to net zero and I believe that Shell is, if not the leader, which I believe—I may be biased—a leader in getting to net zero. I see it as a company that has pledged to get to net zero across its whole value chain working with all of its customers by 2050, which is an imperative as a result of Paris. It will do that by continuing to produce the products and the energy that allow us to have such a high quality of life, but to deliver them increasingly and, ultimately, exclusively in a form that has no associated carbon. It will do that also through a combination of moving to cleaner fuels, moving to more biological fuels, carbon capture and storage, hydrogen, which we have already spoken about, and a number of nature-based solutions.

Shell has and will remain a leader, and, certainly, I intend to make that the case while I am chair, but I do not think I am in any way required to do that, because there is strong support within the company to bring that into place.

You referred to the judgment a few weeks back in the Hague. Shell's CEO has already said that we will comply with that judgment. He always said that if we could go faster we would. He had that in many ways and his team had that potential. We can go into the detail of the judgment, but it says, "Instead of getting to 45% less emissions by 2035, can you do it by 2030?" Clearly, Shell has scope for doing that. We are working through that. Ben van Beurden has already said that we will make sure our plans are in place to bring that about.

I understand the concern of conflict. I understand that I need to be careful about that. In my own personal way I have done it. In the companies that I have chosen to associate with myself, because that is my skillset, and the way I have expressed myself as a senior leader, I

have been very much in favour of the change that is necessary to get to net zero by 2050 on a global basis. I feel determined to do so and I very much hope, done conflict-free in the way we described to Ms Long Bailey, that we can enlist everything with UKRI and UK science maybe to go even faster.

Q14 **Zarah Sultana:** Thank you, Sir Andrew, for that. At the news that you were the Government's preferred candidate for the role of chair of UKRI, Professor Keri Facer, professor of educational and social futures at the University of Bristol, and until 2020 the Zennström Chair of Climate Change Leadership at the University of Uppsala, said, "This decision is like putting a tobacco industry magnate in charge of health research. It is almost as though the government doesn't believe that climate change is happening." What do you say to that?

Sir Andrew Mackenzie: I understand that it might appear that way, and therefore it is not unreasonable. I would just offer a slight counter to that. We all enjoy the benefits of low-cost energy, which in the past, of course, has come from fossil fuels. We want to continue to enjoy those benefits without the carbon. I happen to be the chair of a company that has pledged to be part of that. Many of the investments in hydrogen, in batteries, in very rapid electrification of mobility, in biological solutions and carbon capture and storage will be made by companies like Shell. I think that is a legitimate way to get to net zero while also growing new companies, holding companies to account and so on.

There is a congruence there that perhaps is not obvious to all. I do not feel quite the same level of conflict, but I understand why it would occur that way. You certainly have my commitment through my actions and through my activities outside of UKRI to be true to what I believe is the best way forward.

Q15 **Zarah Sultana:** Linked to those commitments, could you summarise what you aim to achieve as chair of UKRI and how you will be prioritising green innovation above business as usual?

Sir Andrew Mackenzie: Can I do that in two parts? I have put this in my written answers. I am hugely proud—having once been part of it, and in some ways never left it—of the basic research capability of this country and the way in which it is done through our excellent world-class universities. Of course, we want to continue to nourish this and ensure that it remains as strong as it is today.

I am also keen to make further inroads into what I think was the aim of UKRI when it was established: to become much better at pulling more of those great ideas that are developed very much within an academic setting or in labs as well—not all in universities—into very successful industrial endeavours that benefit the whole of the UK; create more jobs; create higher net wealth for the country; and allow us to deal with a lot of social issues as well as obviously making ourselves more competitive.

Other countries have invested more in that and done more of that often off a poorer basic research base. If we can match them or go beyond them, we could be highly competitive and get all the benefits. One of my biggest aims, early on anyway, will be, as well as nourishing this space, to ensure that we are more effective at pulling through and harvesting those great ideas for the benefit of everybody in the UK broadly and in many dimensions, and thinking about that innovation infrastructure and how UKRI and UKRI funding can bring things closer to the point where market pull and trade pull takes off.

I have no doubt that one of the areas where this has to happen most powerfully is in the area of green technology and net zero. This country has shown a lead in that already. If we can connect those basic ideas through the innovation infrastructure I am thinking about and make a better job of it, we have a much better chance of not only leading the world in getting to net zero but creating some of the great global companies of the future that are going to benefit the rest of the world and benefit us through getting all these things connected.

I like to think when you hear me talk about that that you can see my background in the extractive industries, but also in R&D, and how we reform the extractive industries, in some cases already great British companies, to be the great green companies of the future, and grow new great, green companies, and you can see how all this might work in a very powerful way. I am very excited about it.

Q16 **Zarah Sultana:** Thank you. You have mentioned that you will only be performing this role one or two days a week. Given what you have just outlined in terms of your plans, is that a realistic way of being able to work at this?

Sir Andrew Mackenzie: I believe so because I am the chair and not the CEO. The execution and the operation of most of this has to be done by a talented team of people who do it full time. I bring my own personal insights and relationships to help and get behind the work that ultimately needs to be driven by the CEO and her team and, indeed, the executive chairs of the nine councils.

When I was invited to do the job, I was told it was a day a week. I have already given you a 100% update on that of two days. I believe that, in the way that I lead, the way that I empower people, the way that I counsel them, through my track record and through others, and the work of very talented people across UKRI, I can have a very positive impact that I think people were looking for on a one to two-day-a-week commitment. That was how BEIS and others set out the job that I applied for.

Q17 **Zarah Sultana:** Finally, will you be paid for this role, and, if so, how much is it pro rata?

Sir Andrew Mackenzie: I do not have a contract yet because until such time as you are comfortable with my appointment they cannot issue that contract. I have been given a rough indication. I would rather not share that with you, because I may have misremembered, until I see exactly what it is. You will know what Sir John Kingman makes. I think, Greg, you might know. It is something like $40,000 or something.

Q18 **Chair:** I think it is in the public domain.

Sir Andrew Mackenzie: It must be. I do not expect to be negotiating any big increase or anything like that. I am happy to do it for what John did it.

Q19 **Chair:** I just want to check what is in the public domain before I say it. Perhaps during the session I will give it to you.

Sir Andrew Mackenzie: I do not know how much that is. It must be in the public domain surely, what he gets paid.

Chair: We will check that and get an update.

Zarah Sultana: Thank you.

Q20 **Chair:** Following what Zarah asked you latterly about the time commitment, you have already said that you think it will be two days a week rather than a day a week, and you are comfortable with doing that notwithstanding the contract.

Sir Andrew Mackenzie: Yes.

Q21 **Chair:** I think I heard you say that the commitment in Shell is two days a week.

Sir Andrew Mackenzie: Yes.

Q22 **Chair:** And you spend about twice that. Is that right?

Sir Andrew Mackenzie: No. Let us assume that I only work five days a week, which probably would be regarded by my wife as a bit of a joke. The brochure for UKRI said one day. Shell says two days. I have two days to play with. I do not know how I will spread it out, but I reckon that I can easily afford to give an extra day to each one.

Q23 **Chair:** How much time a week do you spend chairing Shell?

Sir Andrew Mackenzie: It is early days. It is about two days at the moment because I can't travel. That restricts me a bit. When I can travel more and see Shell assets, I reckon it will be between two and three days a week.

Q24 **Chair:** It is two now because it is restricted but it is likely to be more.

Sir Andrew Mackenzie: Yes and no. Mr Clark, I am not absolutely certain about these things because I have only just started. You have a learning phase where you have to invest more time—and I will definitely

have to do that with UKRI—and then you settle into things. I am just saying that I have not been able to travel, so I am giving you a rough estimate. I will work full time two days for UKRI and three for Shell, and that is how I think it will stabilise.

Q25 **Chair:** You say it is early days at Shell. What if you were to find that, instead of taking two days, chairing a very important international public company takes four days? Will that not pose a potential conflict of time at least? Your CV indicates you might have the capability, but there are only so many days a week.

Sir Andrew Mackenzie: I have been a very busy and—I think—successful CEO for the last seven years, where I have had to work very hard and be extremely good at time management. To be honest, given everything that is going on at Shell right now, it is not as if it is nice and calm and it is suddenly going to get massive. I am very confident that, under almost all circumstances, I can manage Shell within three days a week, and perhaps slightly less, and be able to dedicate the remainder of the official working week to UKRI. If I ever felt that was not the case, I would come back to this Committee and tell them.

Q26 **Chair:** It would be a bit late because you would be the appointed chair of UKRI at a very important time. The science budget is doubling during this Parliament.

Sir Andrew Mackenzie: Sorry, I miscommunicated. I am very confident that that will not be necessary. I will not disguise it if it changes. It might also change another way. You might want more time of somebody in UKRI. I applied for the job on the basis of a day a week. I will give you 100% more for no charge. My love of these things is such that I will be doing evenings. With the way we work nowadays, it is very hard to divide things into days. It is more hours. I am pretty industrious—I really am.

Q27 **Chair:** This Committee has an obligation to look at the public interest—

Sir Andrew Mackenzie: I understand that.

Q28 **Chair:** —in terms of UKRI. We have no responsibility for the interests of Shell shareholders. If we were a group of Shell shareholders, would we not have reason for concern that you might not have the bandwidth or the time to devote to the affairs of Shell if it encountered some major corporate problem, which I am not aware of but it might happen?

Sir Andrew Mackenzie: That exercise has already been done because, as a result of my standing there, the Shell board discussed this. They looked at what UKRI would involve, and they discussed that. They discussed their expectations of me and they concluded that as long as I did not do anything else, which I said I will not, this was fine.

Q29 **Chair:** I said I would come back with the record of the salary. I am told that the advertised salary for the post is £29,500 a year.

Sir Andrew Mackenzie: Okay, I am fine with that.

Q30 **Chair:** Would you be content with that for two days a week?

Sir Andrew Mackenzie: I thought I might have misremembered that. I am more than happy with that.

Chair: Let us go to Mark Logan next for questions.

Q31 **Mark Logan:** Thank you, Chair. Good morning, Sir Andrew, and thank you for coming along this morning. My first question is linked to what my colleague Zarah asked. If you were successful at being appointed as chair of UKRI, what do you hope to achieve by the end of 2021 in this role, and what does success look like?

Sir Andrew Mackenzie: In the first year, I would like to have achieved a significant enhancement of our ability to transfer technology in the way I have described in answer to other questions. I made that clear in my answers to questions. This is the area where, for UKRI to fulfil its potential, we have to major on, and I would like to think that my background in the way I have described it will help me with that. I already have a very willing UKRI workforce to get on with that.

I certainly would hope that by the end of 2021—which is only six months, thinking about it—I would have gotten to know all the people, understood the way things are working and also be participating in a number of areas where we would be aiming to make the lives of the researchers who receive funding from UKRI better and continuing to explore ways through the combination of the councils to make the whole process of UKRI less bureaucratic and more effective at getting the right research done.

If you were to invite me back in six months' time, I would like to be able to report big progress on technology transfer, a greater sense of the organisation through getting to know the people, and also some real progress in making the lives of researchers easier, more enjoyable and less bureaucratic, and a more efficient UKRI to boot. That is how I would put it.

It is probably an appropriate time to say that many of the things that I believe are possible with UKRI will, of course, be made much more possible if we can actually make good on the various promises to increase the research and development spend in the UK, driving the whole spend in the UK close to what would be the average spend, but also increasing the money that goes to UKRI in line with that increase. If that increase could be achieved, it will give the people who work at UKRI the opportunity to try more different ways of investing in research and technology transfer to bring about some of the things I have spoken about more quickly as a consequence, and for huge long-term benefit for the country.

Q32 **Mark Logan:** Thanks, Sir Andrew. Just to paraphrase, No. 1 is technology transfer success; the second is the internal audience, just getting to know everybody at the organisation; and then, thirdly, it is the external audience of the researchers.

My follow-up question is linked to this. We have been carrying out an inquiry into a new UK research funding agency, of course looking at ARIA. We have heard some of the criticisms from the research community about UKRI. What are the main challenges that UKRI needs to overcome as it matures as an organisation?

Sir Andrew Mackenzie: This is not about ARIA. Is this just about UKRI?

Mark Logan: Yes, just about UKRI.

Sir Andrew Mackenzie: I would be interested to hear the feedback you have received. In the absence of that, the idea of UKRI putting, if you like, an umbrella on top of the research councils, from Paul Nurse's original work, had two among many strands. One of them was to connect up all the disciplines from the arts and humanities to—I do not know what the other end of the spectrum is—engineering and physical sciences. We had much more cross-discipline working going on. I am totally supportive of that because it is through cross-discipline working that you get the best ideas. That, by the way, should include the arts and humanities, and it should include the social sciences and the creative industries, if I can put it that way, because, in my view, good ideas are only going to get market pull if they are culturally and socially acceptable and effective, as well as being a better way to run something.

I am sure there is more to be done, but it is a great first step, and not many countries have tried that. That is very exciting. Obviously, in doing that, if you had broken up nine bits—I will come to Innovate UK separately from that—you would like to think that some of the overlaps in terms of costs and bureaucracy could be tidied up by running things in a more common way, but not in a way that would disempower the individual research councils. Their light touch and—independence is probably the wrong word—their empowerment and their ability to act, as they have always done so very well, needs to be maintained, but at the instigation of UKRI it needs to find a way of maybe lifting the performance further on an individual basis and on a collective basis. Perhaps by being able to look collectively we can get some clues as to how we can simplify.

I know there is work under way led by both academics and BEIS on the whole way in which people apply for grants, how that money is dispersed and so on, which may be able to address some of the complaints you have heard.

The second part of the thing was bringing in Innovate UK, which is essentially the nucleus of what I would call the technology transfer engine. There is a lot more to be done with that. We have a new CEO of that, Indro Mukerjee, who is off to a great start. If it becomes more successful in the way I imagine, it will have a much greater sense of the potential within the base of UKRI, the research councils, to really pull things through out into the market for the benefit of the whole of the UK. The more that that is happening, the more positive the UK will feel about

investment in research, and the more we are likely to be able to attract more research funding to people. I am sure that is another one of the concerns that you may have heard.

Innovate UK is very much—depending how you cut it—one third public sector/two thirds private sector. It picks on certain Catapults. It has its Challenge Fund in order to get these things happening. We need to get even more strategic about this. What are the big levers that we need to pull in order to make the UK more innovative in order to create more market pull for the great ideas that are happening in the ideas factories in the remaining eight councils?

Clearly, part of that is to make them better at doing that. Some of the reforms I have talked about are critical. Part of that is the whole technology transfer issue. How do we handle intellectual property? Is there more that can be done with regulation? Is there more that can be done with cross-government procurement to create the market pull as well through the advocacy that I would do, trying to attract a lot more industry and inward investment into R&D in the UK alongside the strength of our research base? I do not know if that has addressed the concerns that you have heard from others.

Q33 **Mark Logan:** That is very helpful, Sir Andrew. My last question is linked to what you have just been saying and at the very beginning, when you talked about the reasons for wanting to be with UKRI and that you saw it as a great vehicle for the competitiveness of the UK and the future.

I read a speech that you gave, I think it was around 2015, with BHP, and it may have been in Australia. Quoting some of the comments from that speech, you said, "China's investment in R&D has already outstripped the EU and will match US levels within four years."

Sir Andrew Mackenzie: That is correct.

Q34 **Mark Logan:** You went on to say, "Great leaps forward in innovation will be as likely to come from Mumbai or Shanghai, as Silicon Valley," and, "The world's centre of gravity...is steadily shifting east to Australia's near north."

In this role, what opportunities and challenges do you see in the Asia-Pacific region, and what can we learn in the UK from your experience?

Sir Andrew Mackenzie: It is a great question, Mr Logan. I would still stand by the remarks in that speech—in fact, even more strongly now five years later. I might broaden it. The pace with which many countries in Asia are industrialising rapidly is something to be very thoughtful about in different terms with regard to the competitiveness of the UK.

Since I gave that speech, I have been in China. I have seen some of the innovation going on in things like artificial intelligence. We are well aware of some of the things that they have done, although perhaps not as impressively as some other Asian countries, in the area of electronics and

the equipment to support a number of things. They are certainly investing very heavily in R&D, which is why I think for the future success of this country we need to increase our investment in R&D above what it is today, both public and private.

There is a little bit of a competition about it. There is no doubt that, if we can get UKRI working in connecting our basic research through technology transfer, which is in my view far superior to many of the places in Asia—they are trying to buy into it and they are trying to pinch people—we can keep up with them, and potentially outrun them, provided it is associated with the right level of funding and the right type of administration in the way in which we run UKRI.

What those countries demonstrate—I would say this about Korea and Taiwan, and I would say this about Japan, which is more on the western model—is that they co-fund a lot more R&D publicly. They use public bodies, their equivalents of UKRI, to create more cross-industry work in order that the nation becomes more competitive. You have seen this most powerfully more recently in things like semi-conductors, where Samsung and their equivalent—I forget the four-letter acronym—in Taiwan have really moved forward in the competitiveness of their chips, even relative to the US, where the absence of Government funding perhaps is one of the reasons for that.

I am a huge advocate of public/private working, and, certainly, that is how Asia are winning. I think we can keep up with or even go faster than them if we get that balance right here.

Mark Logan: Thank you very much, Sir Andrew.

Q35 **Chair:** Thank you, Mark. To follow up Mark's questions on China, on your CV, Sir Andrew, you say that you were a member of Premier Xi Jinping's advisory council. What advice did you give to President Xi Jinping?

Sir Andrew Mackenzie: Just so you know, it was previously Li Keqiang, and then the Premier stepped down and the Chairman took over. Basically, it was a group of western industrialists. There was one representative for each major industry. I was there, as it turned out, for both oil and gas and mining. China is a huge customer. There were people from banking, supermarkets, motor manufacturers, semi-conductors and so on—some Americans and some Europeans. I was the only Australian. We were between 13 and 15. There was a logistics company. Essentially, it was set up to ask western CEOs what they should do.

Q36 **Chair:** What advice did you give them?

Sir Andrew Mackenzie: I am coming to that. The basic advice was probably to open up more, to let the private sector in more, to have more freedoms and perhaps to put less weight on state-owned enterprises. You could say this was partly arguing our case. It was a great belief that if they opened up more their economy would perform better.

They were very formal things, I have to say. It was all televised and very open. We normally only got to speak for maybe 30 seconds each. Sometimes we would appoint spokespeople. It was generally about the kinds of things they needed to do to attract more western investment.

Q37 **Chair:** Would you say they took that advice?

Sir Andrew Mackenzie: Yes and no. The one thing that they have continued to do is to maintain a very strong nationalised or public sector in most of the commanding heights of the economy. They have made some small regulation changes with or without our advice. I do not know. I would say mixed.

Q38 **Chair:** One of the big questions for UKRI and particular research institutions and universities in the UK is what the relationship should be with China. What is your view of that?

Sir Andrew Mackenzie: My view of that is that collaboration and working across borders to create a real, effective sharing of ideas, ultimately, is good for lots of reasons: for geopolitics and for advancing knowledge. However, I do think there is a national security issue about how much we might choose to share with China, and we need to be very careful. We should not offer up hard-won intellectual property in the UK just to get some sort of collaboration. We need to view things through a national security lens.

That goes for other things as well—about protecting basic industries and so on. We need to be open but not naive, and we need to recognise that, without careful thought, too much transfer could occur to the disbenefit of the UK.

Q39 **Chair:** You refer to a national security lens. Should there be a human rights lens?

Sir Andrew Mackenzie: Well, is that a matter for—at a personal level, I would think so. Yes.

Q40 **Chair:** Would you regard UKRI as needing to contemplate these matters?

Sir Andrew Mackenzie: Would this Committee like UKRI to consider those matters? Obviously, we should expose them.

Q41 **Chair:** This Committee does not direct UKRI. The Committee is here to understand the direction of UKRI and to scrutinise it. It is very important that the chair and chief executive are responsible for the strategy, but we are interested in what you would propose.

Sir Andrew Mackenzie: I am struggling a little bit with my personal view and not going beyond my brief.

Q42 **Chair:** How will you reconcile them if you were to be appointed?

Sir Andrew Mackenzie: I do not think there is a difficulty in reconciling them. I completely agree with your concerns on human rights. I am just

asking if it is the expectation that UKRI would actually consider that. They absolutely have to put them on the table. I think they have to consider them. Of course, they should. I do not disagree with that. I suppose I am asking for help as to how you would like me best to do that as chair in some ways. You are raising issues as to the extent to which the board and the CEO get sufficient input from other people in government about concerns on human rights and national security, which we can help form, in order that we do our job well and make those choices correctly.

Chair: Okay. Chris Clarkson.

Q43 **Chris Clarkson:** Thank you, Chair, and thank you, Sir Andrew. I want to pivot away from China and geopolitics for a minute. Obviously, the biggest pressing issue at the moment is Covid-19. I am interested to know your thoughts. What lessons can UKRI learn from the pandemic?

Sir Andrew Mackenzie: The main lesson that we can learn is that science and basic research matter, and they are going to matter even more. The very flexible and very rapid way that the country responded to this, much assisted by that same can-do attitude across a lot of UKRI-funded activity, is to be celebrated. In that celebration, we need to think about how we could apply similar kinds of pace, flexibility and agility to all sorts of areas that UKRI is working to create—many of the things that I was talking about earlier that enable great British successes not just in, for example, the roll-out of the vaccines or the creation of the vaccines, but in many of the other areas and sectors that are important to us. There is an enormous amount we can learn from it.

To simplify it into two, No. 1 is that more funding of public R&D will make a big difference to the performance of our economy, short, medium and long term. I am certain of that. If we are going to build back better, if we are going to really grow the base of the economy, we need to invest more in R&D. As chairman of the UKRI board, I would undertake that UKRI would do this in a very responsible way that ensured we got this follow-through on a similar level in other areas.

Secondly—I always used to struggle with this as well as a leader—we are often much better in a crisis when there is not a crisis. If we could just remind ourselves of what we did to be effective in a crisis and do it without having to have a crisis, we could equally pull through and maybe do some great things elsewhere in many other sectors, not just in health, obviously—that will be talked about—but in some of the digital space and automation we are talking about, and, of course, in the net zero space.

Q44 **Chris Clarkson:** Thank you, Sir Andrew. You are talking about more funding. How do you think UKRI can contribute to the UK's target to spend 2.4% of GDP on R&D by 2027?

Sir Andrew Mackenzie: Obviously, some of that has to come because UKRI is so appealing that people want to come along and co-invest with

us or site their research facilities here because they are next to such a powerful, distributed organisation, which I might describe UKRI as. It should not all be coming from the public sector. We should be committed to making the public spend more efficient.

Putting ourselves on a trajectory to grow UKRI's spend in line with what that growth would need to be to get to 2.4% would be more than welcome. It is almost pivotal, I think, in delivering some of the broader vision and aims that I have, because it would allow us to introduce new ways of doing research and development as well as looking after the base and diversity, which is also necessary. We need to be trying new ways, particularly in this innovation space.

I am actually pleased we are doing ARIA. We will learn from that. If we do more in Innovate UK, we will see ways that might inspire what is going on back into the research councils. If we want the R&D budget of the whole country to grow, we should not expect it all to be done by the private sector. The public sector expenditure needs to get on a steeper slope than it has been of late.

Q45 **Chris Clarkson:** Thank you; it is interesting. I want to follow up on that. Like you, I started off in the private sector, and I appreciate it works very differently from the public sector. How will you handle some of the challenges around budget constraints? For example, UKRI might get its budget set very late in the day; you might be given short-term funding for certain projects rather than longer term; the Government's priorities might change around spending. How will you integrate that into the growth model?

Sir Andrew Mackenzie: I would have to work closely with the CEO and her team in thinking about these things, and add my advice where it is appropriate.

I come back to my answer. Of course I understand the challenges of setting a budget, particularly because of the high level of indebtedness that has been created as a result of Covid. I am not unsympathetic or uncaring around that. I recognise that you, as politicians, have to wrestle with enormous amounts of funding opportunities, including what might go to UKRI, as you work with the Treasury in order to create the right kind of budget for the future of the country. I accept all of that.

However—you knew there was a "but" coming—I would come back to the fact that the very success of our response to Covid, and the success particularly of the vaccine piece, should be seen as a reasonable case that, if we invest more in basic research and our ability to pull that through into business success, which has huge impacts on the competitiveness of the economy and the ability therefore for there to be a much larger base from which to raise money in the future, with all the understanding I have shown about indebtedness, there should be a very strong bias towards increasing R&D spending as one of the most powerful

ways that we can keep our country competitive and growing, and providing jobs and providing a better quality of life in the future.

I would ask you as members of the Committee to make that case. We understand some of the other competition, but we would like to have a fair degree of priority because it is one of the best levers to make this country successful in the future.

Q46 **Chris Clarkson:** We can make the case to Government, but how will you make that case to the private sector, which is also highly indebted because of what has happened during the pandemic and is looking carefully at its expenditures?

Sir Andrew Mackenzie: There is a simple answer and a more complicated answer.

The simple answer is that the more we occur as a science based superpower and we occur as a country that really believes in research—I use science and research interchangeably; I believe strongly in the arts, humanities and social sciences as well—the more attractive it will be as a place to come and work. We will be training the right technicians, we will be training the right people, and there will be more people to rub shoulders with. At the same time, we need to look at some of the reasons why they might not be coming—regulation, maybe trade issues as we think about things and so on. We need to look at all those incentives to bring them closer. That was the simple answer.

The more complicated answer is how you weave in some of the strength of the venture capital funds, of how they work, and how they then feed into bigger companies. There has to be a sense of scale. It is not enough to say that we have produced a bunch of start-ups if the start-ups are only two or three people. We have to get them pulled through to influence big companies and create new companies that end up headquartered here and listed in London for it all to come together in the way that I envisage. If we do that and we do it well—I do not think 2.4% will be enough, to be honest—breaking that barrier will become much easier, but let us just get to 2.4% first.

Q47 **Chris Clarkson:** Would you say there is any merit in the Israeli-style system where you find most start-ups have their nexus in government? Usually, IDF is responsible for quite a lot of these. Is there a comparable model that we could have here?

Sir Andrew Mackenzie: Could you speak a little slower? Your line is not great.

Chris Clarkson: Sorry.

Sir Andrew Mackenzie: The Israeli nexus, you said, but you defined it.

Chair: Repeat the question, Chris.

Sir Andrew Mackenzie: Yes, just repeat it.

Q48 **Chris Clarkson:** Is there any merit in the model that is used in Israel where quite a lot of tech start-ups usually begin as part of the Government—usually the IDF—and then they are spun off into the private sector?

Sir Andrew Mackenzie: There are a number of models around the world. I am familiar with the Taiwan model and the Korean model. I know a bit about the Israeli model. I have lived and worked in Germany. I have seen the US and Australia as well. A common thread I would take is that there has to be a bit more involvement of Government money to enable technologies that are hard to make money from in a narrow private-sector way. Some people call them generic technologies, which then become the platform. They can also make the standards for people to then start innovating for it all to be done with private money. The Australia model is a way of doing that. There are other models as well.

That is what I am talking about. If, and hopefully when, we get more funding for UKRI, if we can put a bit more behind that co-funding through the innovation phase in the way you described and build the whole way in which we run Innovate UK, I would definitely support that. People talk about this valley of death; we have big companies and we have successful basic research, but somehow we cannot get them across the valley. We need to build ways across that valley.

I have mentioned some of them in my other answers. This co-funding is appropriate and partly the role of the Catapults inside Innovate UK, and there are other models as well—the Challenge Fund, for example. We need to do more along Israeli lines, Taiwanese lines, Korean lines, Singapore and Germany. You will probably find quite a few of our competitors in Europe do more of this than we do right now. They achieve more with less good basic research. It is a frustration that our basic research has not translated more than it should have done. I think it can, and UKRI should stand for that.

Chris Clarkson: Thank you.

Q49 **Chair:** Thank you, Chris. Just to follow Chris's theme about private sector investment to supplement state investment, do you have a view on the effectiveness of R&D tax credits in terms of incentivising private sector R&D?

Sir Andrew Mackenzie: I need to look into that in a bit more detail. I think they can have value. We just have to be careful that people find ways of calling activity that was going on anyway R&D in order to get a credit. That would be my one concern to think about.

Q50 **Chair:** In your business experience, did you find them effective? Did it cause them to invest more?

Sir Andrew Mackenzie: In the companies of which I have been a part, it was not something that was a serious incentive to us. I was not really in the high-tech sector. Most of our innovation and research was done very close to operations. Sometimes, there was a very broad spectrum of what was pure R&D in terms of what was twiddling a knob on the nightshift and deciding where you made that break and so on.

What I am saying is that we need to protect ourselves from defining it in such a way that work that was happening as a continuity of innovation gets re-badged as R&D when it would have happened anyway. Looking at the broad incentive set to create more R&D, including tax credits, is worth looking at. I do not want to give you a definitive answer because there may be other and better ways, and people in the Treasury may have some ideas as well that I would be happy to talk to them about.

Q51 **Chair:** In your experience, you do not have a striking example of R&D that would have been done because of R&D tax credits that would not have been done otherwise.

Sir Andrew Mackenzie: Not directly, but I do indirectly have examples of smaller companies that I got to know, and, in some cases, it was nascent solar companies or people I have had associations with for whom incentives from the Government to make it happen, whether by way of tax credits or some of the things we talked about with Mr Clarkson, made a big difference. Absolutely—no question.

Q52 **Chair:** With regard to the big companies, did BHP claim any R&D tax credits?

Sir Andrew Mackenzie: Of course. When they were available and they were legitimate, we claimed them. I am indicating to you that there were many other incentives that were probably more important to us in order to do that. They are an instrument that is worthy of discussion, but how it is deployed and how it works needs some care. If it is a way of getting money to people who would not otherwise invest in innovation that is important for the nation, that is great, but we need to be careful about a situation where, by offering R&D tax credits, work that would be done anyway as part of business is just re-badged. I am eyes wide open about that. I do not want to say, "Yes, tick." Yes, look at it, but the prime aim has to be getting public money where it gets the incentive to the people who change course as a consequence of that and start the ball rolling towards creating decent-sized, competitive UK companies. There may be big companies out there that do more as a consequence of that.

Q53 **Chair:** But not from your own experience.

Sir Andrew Mackenzie: Not in the extractive industry, no. In other industries it may be a way of bringing more R&D centres to the UK. It needs careful study.

Q54 **Chair:** Money is always finite and tax relief is the same as a piece of public expenditure when it comes to public borrowing and public

spending, because we want to get—

Sir Andrew Mackenzie: I understand that. That is why I say there may be better ways to spend public money than tax credits, if we are talking about incentivising the things that I have been discussing with you at this Committee meeting. I have seen them work, but I see some of the downfalls. I am happy to offer advice, and I am sure UKRI will do the same.

Chair: Thank you. Graham Stringer.

Q55 **Graham Stringer:** There are a number of research councils on different budgets. First of all, how would you familiarise yourself with the individuals and the work of those research councils?

A much more difficult question is, if you thought there was an argument, which there is, that astronomy and particle physics should get more money, or, after the Covid epidemic, the Medical Research Council and the biological research councils should get more money, how would you deal with those arguments when you had familiarised yourself with them?

Sir Andrew Mackenzie: Ideally, you would want to have a strong sense of how individual bits of basic research may ultimately flow through to the broader benefits for the country through it being more competitive, more innovative, better quality of life—the things I have said in answers to many questions—and be able to understand sector by sector what we need to do to lift the performance of those sectors within the UK to a level that we thought made sense from a policy perspective; and how much of that lifting was down to more basic research and how much of that was down to better regulation or some of the other things we have talked about in answers to questions. Then you come up with a sense of things that may need to be favoured more or favoured less in the debate.

But there is another consideration, which is that the health of basic research means that we work on the best, more tractable, challenging ideas with the very best people and the very best equipment, and that we should always be looking to foster excellence in those areas. They may not be immediately applicable in the way that my simplistic model gave it. You may not be able to do that. You then have to make a judgment on excellence and on the value to our culture of being a leader in a particular field.

There is a very famous—for me—book called "Pasteur's Quadrant", which basically says you divide research up into four quadrants. Is it applicable early on and is it real breakthrough stuff? It is Pasteur's quadrant because he was making breakthroughs in microbiology, but he was immediately able to apply that with fewer people being poisoned, and therefore it is the real sweet spot.

That is not the only area where you can fund. There is another quadrant, which you would call the Einstein quadrant. Nobody really knew what the applications for his were, but it was clearly breakthrough stuff. Over time,

it became just as groundbreaking as Pasteur's work. You have to have a sense of doing that as well in pushing the forefront of human knowledge.

Ultimately, all research is applied. Some is applied now and some is applied later. But there is a third quadrant, which is more down to basically just testing things. It is sometimes called the Edison quadrant, where it is not really breakthrough science but it is great for business. It is under the Pasteur quadrant. You could always argue whether much of that needs to be done by the public sector. It was more important that Edison was in his lab testing lots of filaments to find the best light bulb. Should the public sector fund that? Probably not, but there will be funding underneath that of generic technologies and infrastructure technologies, and that is very true in things like semi-conductors that you have to fund. It is complicated.

What I want to leave you with is that it would be good to see more relevance of what we are doing to improve individual sectors of the economy, but do not hear that from me as somebody who therefore wants everything to be applied and does not believe in excellence and pushing the frontiers, as you said, of astronomy or something else, because we never know when that might be applicable. We always have to think about research in the way that it enhances the cultural fabric of our country, which you cannot evaluate in the narrower economic terms that perhaps my first way of looking at it would do. I am a great believer in not over-managing who gets what and not over-determining it, but just paying great people to push hard on the frontiers of knowledge, whether it is applied now or applied sometime in the future yet to be determined.

Q56 **Graham Stringer:** It is interesting that Einstein could not get any funding when he started, could he?

Sir Andrew Mackenzie: Exactly. He had to go and work in the Patent Office. You have made my point. Hopefully, that would not happen today in UKRI.

Q57 **Graham Stringer:** One cannot disagree with what you say. When Paul Nurse sat in the seat you are sitting in when UKRI was being set up, he pointed out that over the time of the research councils, apart from one reorganisation of STFC, the percentage funding for each council had remained the same because the politics of shifting resources between them was too difficult. They all have excellent researchers and good ideas, but the percentages remained the same, so it is a problem. I would put more money into medical research at the moment. If you talk to the astronomers and particle physicists, they have a gripe because they think they lost out over a period after that reorganisation.

How do you practically deal with that problem? I cannot disagree with the principles you enunciated—fine. I am sure those principles would have been familiar to everybody dealing with these problems, but they have not enabled change to be made.

Sir Andrew Mackenzie: I will obviously be asking all questions of UKRI staff as to how we can do that better. I understand the frustration that you have and that Sir Paul Nurse articulated. I am probably just saying the same thing again. Ultimately, we have to understand the policy objectives of an elected Government—it is public money, after all. Without in any way becoming too short term about it and in some way putting at risk the stuff that is harder to justify in policy terms, we have to provide more data, more longer-term feeds as to what is working in the economy and culturally, to effect those changes rather than it just being a judgment. We have to listen to a lot of people and try to feel where the centre of gravity is.

Certainly, when money is finite, it would be good if we could find a more rigorous—it will not be super-vigorous—way of how we distribute some of those funds in research. It is hugely complicated. It goes right into the universities, the make-up of universities, university funding, how you balance all of that, while going for excellence and going for research that is feeding into the policy objectives of the elected Government, which hopefully are also looking forward 20 years and 50 years and not just the next two.

Q58 **Graham Stringer:** It is interesting that just before you mentioned the valley of death I had written it down as a question to ask you. Again, you would not have found any major industrialist or academic thinking about these things who would not have recognised the problems of converting brilliant world-leading science into industrial applications going right back to the ’30s. The problem has been recognised. Why do you think it has not been mastered and solved? Why do we not convert as many of our innovative ideas and breakthroughs into major world companies?

Sir Andrew Mackenzie: It could be two reasons, but I will give you the first reason. I do not think we have spent enough time worrying about how we build bridges across the valley of death. There has been a sense that, hopefully, if we continue to encourage the development of a strong industrial private sector, and we encourage a strong basic research sector, sooner or later they will mate and it will all be solved. Other countries have chosen to invest more in, what you might call, bridges across the valley of death. We have spoken about them. Israel has been mentioned. I mentioned Korea and Taiwan. There is a different system in China because, as I said in answer to Mr Clark, everything is public there because they have kept most of their industry on the public side of things.

I am sorry, I am rambling. We have not grasped the nettle as firmly about how we build those bridges and we invest in that. It means that there is a bunch of things that need to happen, probably under Innovate UK, where more co-funding of the public sector with the private sector is necessary to make that happen. I would argue that perhaps that is the reason, absent a crisis like Covid, which clearly made it happen, or a war,

why we do not do enough of that in peacetime, and we need something that works without a crisis and drive that. That would be my main reason.

Until we have tried that in full, I only mention my second reason in passing. It could be that the incentives that we put on our academic staff, which is about excellence, citation and reputation, do not steer them strongly enough towards things that ultimately might have an application. That would be my second port of call.

Q59 **Graham Stringer:** This position gives the person occupying it access to the top academics in our best universities, to the Prime Minister, to all the positions of power and influence in this country.

I would like to ask Zarah Sultana's question in a different way. You have a distinguished academic record and have worked for major oil companies. The Government have said that they will get to net zero by 2050. I think there is an educational role. The Government make those commitments. Most of the Government Ministers are not scientists. I can't think of one. It will be very difficult. The wealth of this country and the industrialised world, as you said earlier, has been based on cheap energy, basically relying on the energy density of fossil fuels. It will be much more difficult than I ever hear any Minister say to recreate that energy density that will allow us to have a modern industrial society.

Do you see part of your role as educating Ministers and the country? You will get invited, undoubtedly, on to the "Today" programme and other major outlets. Do you see part of your role as educating both Government and the country?

Sir Andrew Mackenzie: I am happy to do so. I agree with everything you say, by the way. It is a very surmountable challenge. Where there is a will, there is a way. But it is a tough challenge. There are many technologies that have to work at scale that have not yet been scaled up. When we scale them up, we will find, I am sure, that some of them work and some of them do not. Some of them have unintended consequences. The innovative requirement is much higher than we think, because I do not think we have enough things waiting to happen to get us to net zero with 100% confidence that we will get there.

There are a number of other things in the wings. There are lots of ideas I hear, and if we accelerate those we can get there. You are right. You have hit the nail on the head. The energy density issue is a big challenge. It is not replicated. You need an awful lot more of an interaction with the world to capture renewable power for the same megawatts of a wind farm or a solar farm compared to a combined cycle gas turbine or a nuclear plant. For other liquid fuels, you will need bigger tanks to raise the same amount of energy because of the difference in density. Also, in the case of hydrogen, the very small molecular size means it will be harder to keep contained. You will need better membranes. You get brittle steel.

There is no reason to be put off by it, but we are right to remind ourselves that the challenge is a stiff one. That is why we think that, to maintain good order and to make sure that people are not deprived of basic energy, there has to be a phased withdrawal from fossil fuels but not a cliff. A lot of the challenges are not just in the energy sector. You will be aware that the industrial sector—steelmaking, cement making, chemicals—and the agricultural sector are all major emitters that we need to get our arms around as well where renewable power is irrelevant. It might provide some of the heat, but the basic chemical reactions, which you obviously understand, throw off a lot of CO_2, whether you heat it with renewable electrons or with a hydrocarbon flame.

Chair: Thank you very much, Graham. Finally, Dawn Butler.

Q60 **Dawn Butler:** Thank you very much, Chair. Thank you, Sir Andrew. I have a couple of questions.

You have extensive international experience. I think you speak six languages. It would be interesting to know what they are. How will you seek to draw on this as chair of UKRI?

Sir Andrew Mackenzie: Do you really want to know? They are Dutch, German, Spanish, Norwegian, French and English, of course. I have had the luxury of being able to live and work in many of the countries where they are spoken. Therefore, it is much easier to learn than trying to do it in a night school in England.

There are two things that will help from an international side of things. I have a perspective as to how this works well and not so well in the many countries that I have lived in. Obviously, I was more of a researcher in France and Germany, and more of an industrialist in the other countries and obviously in English-speaking countries like the US and Australia. I am a very significant visitor to most of Asia over my more recent past, and indeed I had a lot to do with Africa when I was at Rio Tinto.

There is a perspective of what works and what does not work, and should we try this. We spoke about that earlier in this Committee. If we really are going to make a big breakthrough in doing more with R&D in this country, we need to attract more international companies to come here and think that this is a good place to have their R&D centres. I would hope that my connections and my internationalism could be part of the enrolment of those companies to come here.

I think I can provide perspective of what works and does not work in many countries in the world and also through relationships maybe draw more companies to come and invest in our R&D facilities here.

Q61 **Dawn Butler:** I agree with your assertions that we need to do more around intellectual property and technology transfer if we are going to progress and be world leaders, especially as we are trying to hit our net zero target by 2050. On a scale of one to 10, how would you rate Shell's environment credentials?

Sir Andrew Mackenzie: Oh gosh. I will resist giving you a number. Shell has always been a leader of the oil and gas companies—now energy companies—in pushing towards net zero. It owns the challenge to get the products of the company fully to net zero by 2050 and is investing significantly both here in the UK and elsewhere in order to get there, and through that investment will try many things. If they work well, others will copy, and we will pull people along.

Shell believes that that transition can be managed—as I said in conversation with Mr Stringer—on a gradual basis. We still think that the UK will be producing oil and will be more or less self-sufficient in 2050, and will probably still be importing gas, but because of everything else we have done the country and the company will be at net zero.

Q62 **Dawn Butler:** That sounds good, but Shell has just recently lost a court case, as Zarah Sultana spoke about earlier. For the first time, the court found that a corporation like Shell was liable for causing dangerous climate change. I am not quite sure how I marry what you have just said to the outcome of the court case. What have you learnt from that court case?

Sir Andrew Mackenzie: What has Shell learnt? The upshot of the court case was that Shell was asked to go faster and to cut emissions by 45% by 2030 rather than 2035, and the CEO has already accepted that we will do that. Previously, he always said Shell would go faster if Shell could. A lot of these things are still very much for legal debate, and I would rather not comment in detail.

To your other remark, of course, there is carbon in the atmosphere right now that arose from Shell products in the past. That was associated with providing—again, in a conversation I had with Mr Stringer—a very effective source of low-cost energy that powered lives and powered economies. Up till now, the availability of cheap energy correlates more or less one to one with GDP. Shell has said unequivocally that, of course, it wants people to still have that power, that energy, and the materials, but by 2050 it wants to provide all of that without the carbon. Shell is committed to delivering that outcome in a way that is very much in line with the goals of Paris.

Q63 **Dawn Butler:** In Shell's commitment to doing that, are they not destroying countries, housing and villages in that process, and therefore not being progressive in regard to climate change?

Sir Andrew Mackenzie: How do you mean destroying? On the one hand, we enable enormous amounts of things to be built because of the energy and the products that we produce. Is this a sea-level issue you are talking about?

Q64 **Dawn Butler:** I am just thinking about Friends of the Earth and the court cases that they have against Shell and Shell's credibility in regard to climate change. How will that work with your role with UKRI?

Sir Andrew Mackenzie: When we were talking earlier about the conflicts, I was very clear that I will be very conscious of the need to keep the two roles very separate. I am the chair of Shell. The vast majority of the interactions that occur between Shell and the UK Government will be done by the CEO, and people who work for him, and the country chair in the UK. I will have very little to nothing to do with that. In my interactions with the Government, I will almost certainly be acting as chair of UKRI. We talked about that at length earlier.

Q65 **Dawn Butler:** Rebecca Long Bailey mentioned it. If it became the case that it was irreconcilable and you could not separate the two because you have a responsibility under the Companies Act, and you could not separate the two because you had a responsibility to the shareholders of Shell—this might be difficult to answer on the spot—if you had to choose between the two, which one would you choose? Which would take your priority? Would it be Shell, or would it be chair of UKRI?

Sir Andrew Mackenzie: I think you have given me an out. It is very difficult to answer that on the spot without giving me an example. As I said to Ms Long Bailey, I have had to manage those sorts of conflicts throughout my career. You put together boards of people who sit on boards of other companies, because that is the only way you can get the kind of collective firepower bringing in ideas from elsewhere to create a good board. From time to time, that breadth or portfolio lifestyle of people, which I have just come into because I have only just retired from being 100% CEO of BHP, produces a conflict. I am absolutely certain there are registers on the UKRI side and there are registers on the Shell side that list them very formally, and they are in the reports of the company. Whenever they arise, the individual, up to and including the chair, must recuse themselves from any decisions.

I think that is unlikely to happen often for the reasons I have given. I am a non-executive chair of Shell, and the company is spoken for and run primarily by the CEO and full-time team. If it were to occur, I believe there are ways of doing it.

All of that said, in the same way as I said to Ms Long Bailey, the climate solution will require a lot of close working between energy companies old and new, and other companies that are the consumers of energy products, Government and public research, and a whole bunch of start-ups and so on. Being able to bridge some of these things may occasionally be a good thing, not necessarily one to be concerned by a conflict. The conflict risk and so on will be ever present in the front of my mind.

Q66 **Dawn Butler:** I agree with you. I think that is why there may well be a conflict. If you were no longer chair of Shell, there would not be that conflict; there would just be those connections. Because you will have a responsibility under the Companies Act, there is a slight conflict. I also agree that we probably need somebody in the role who will be innovative and creative, and have those understandings of where to go next and

where to take UKRI.

I am curious. Who at No. 10 tapped you up for the position?

Sir Andrew Mackenzie: I think that is too strong. They, along with others, were trying to secure a very strong candidate list. I was approached by—I am not going to give you the name—somebody who I imagine spoke for some views in No. 10, but I did not speak to any senior elected person there. I spoke to one of the officials.

Q67 **Dawn Butler:** Was it Dominic Cummings?

Sir Andrew Mackenzie: No, it was not Dominic Cummings. I only knew about it and I was asked if I was interested at the end of February, just before the closing date.

Q68 **Dawn Butler:** Why don't you want to tell us, before I move on? It should not be that controversial if it was not Dominic Cummings, should it?

Sir Andrew Mackenzie: I do not know enough of the rules of the game. There were two or three people who independently spoke to me about it from within No. 10. They said, "Why are you not applying? You would be great for the job." I got the same encouragement from Sir John Kingman, the current chair, and from some people in academia who were looking to see that. It all came more or less at the same time.

Q69 **Dawn Butler:** Back to climate change, with the creation of ARIA, we are hoping to make progress in the law by trying to get a commitment that whatever we do going forward does not negatively contribute to us trying to hit our net zero target. With your role on Shell, how much money does Shell spend on anti-climate lobbying?

Sir Andrew Mackenzie: We do not spend money on—we are—

Chair: The questions need to be about the UKRI role. We can summon witnesses from Shell on different matters. Your questions, Dawn, have been germane so far to the interaction. Perhaps you could ask a question that keeps it in order.

Q70 **Dawn Butler:** Thanks, Chair. I am just trying to pin down the commitment of the Government's preferred candidate to climate change and hitting our net zero target by 2050. I am just trying to tease out what the other job is that our potential chair has with Shell. What is Shell's commitment to climate change?

Sir Andrew Mackenzie: I do not know if you heard the whole of my testimony. My commitment is unequivocal—to net zero, not to climate change. For over 20 years I have been a leading proponent within an industry of us delivering what has now become the net zero target, or former versions of it, through providing energy and materials that support a net zero world. As I have become more senior, I have been more effective in doing that. As I said, I was the first mining executive to commit to reducing the scope 3 emissions from mining products. At the time, I was the only mining executive doing that, and I was roundly

criticised by the industry for doing it. People have come round to doing that.

I chose to become chair of Shell because I believe they are a leader in creating the net zero energy company of the future that the world will need. Read my speeches. Look back at me. I have always been at the forefront, even at times when it was not very fashionable.

Dawn Butler: Thank you so much, Sir Andrew.

Chair: We have lost the sound, Dawn.

Dawn Butler: I was just saying thank you, Chair.

Chair: I do not know if we can restore the sound to Dawn.

Dawn Butler: I was just saying thank you.

Q71 **Chair:** I think that was a sign-off, a mime. Thank you, Dawn. That came at an opportune rather than an inconvenient moment. Thank you for that.

Some final questions from me, Sir Andrew. Obviously, one of the big agenda items for the Government is what they call levelling up, which is about the performance of different parts of the country. The Committee and its predecessors have taken evidence over many years, as Mr Stringer and long-standing Members will attest to, as to the concentration of a lot of national research funding in a small number of research institutes, sometimes referred to as the golden triangle.

What is your perspective on the role of UKRI in investing across the country? Do you think there is a problem? Is there over-investment in the golden triangle, or is that a necessary reflection of where the best funding opportunities are?

Sir Andrew Mackenzie: I am not over the details here. It is the sort of thing that I would want to ask more about if you approve my appointment.

I believe there is something called a places strategy within UKRI that is designed to be a positive contributor to the levelling-up agenda. Our university network and, certainly, where people go to learn is more evenly distributed throughout the UK than probably some other things that need to be levelled up. I know that universities can be critical components of the wellbeing of smaller but none the less considerable, shall I say, northern towns or outside the golden triangle.

I spent a few years in Hull running a chemical plant, and I know the university there was a very important part of that city. I am sure there are many similar analogies, including in my home country of Scotland. It is very important in what UKRI does that we need to consider the fabric and the health of those universities in key towns. Particularly suggesting that more funding might come into Innovate UK, which is something that tends to be more widely spread, then we can certainly look at the way in which

we stimulate more of the technology transfer with a view to levelling up. Whatever the history, I would suggest that UKRI could definitely be a helpful partner in realising the Government's levelling-up objectives.

Q72 **Chair:** You are right that universities and particularly teaching in universities is better spread across the country than wealth, for example, but research funding does not follow the same pattern. Do you regard that as a problem?

Sir Andrew Mackenzie: It is an area worthy of examination. I certainly think there should be a bias to it being less of a problem. You say teaching universities. A lot of them do research and it is part of the fabric of those universities. The way in which they touch and change young people's lives is fundamental. Beyond UKRI's brief, it is very much that we look to that, maybe hoping that more of them on a net basis—I am not suggesting you have to stay in the same town you go to university in—will stay in and around those universities that give them such a great start to life.

There will be opportunities to do what you are suggesting, which is that, if we are going to build something new and feel we can attract researchers there, and it is an area that is relatively deprived in terms of the golden triangle, we should do so. It has a role to play. I am sort of saying it the other way round. It is perfectly reasonable as a policy objective of this Government to ask UKRI to play an important role in the levelling up that we are doing. There will be some levers that UKRI can pull.

Q73 **Chair:** One of the important programmes that has been much discussed recently is the Horizon programme in which we are paying quite a substantial subscription in return for participation. Have you given any thought as to whether you think it would be better for the value of that subscription to be in the hands of either UKRI or UK institutions, or are you content with the proposal that we should—

Sir Andrew Mackenzie: Fund it from BEIS?

Q74 **Chair:** That it should be funded as a subscription. Would you rather UKRI had that money, or do you think that is the right approach?

Sir Andrew Mackenzie: These are questions I will ask of UKRI staff. I come from a way of thinking that you do not have to control everything to have influence. There are lots of ways in which you can network and connect things up without everybody being on your organisation chart. I do not have a strong view on that. Maybe others in UKRI do, and I will ask them.

My going-in point is, for whatever reason it has been chosen, that they will be separate. Similarly with ARIA, let us just make sure we are networked because they can learn from UKRI and UKRI can learn from them. It is a very important programme. It is one that very much supports, as I understand it, younger, budding researchers to pursue

excellence—and this is a little bit of the conversation I had with Mr Stringer—in whatever area of inquiry they have to push the frontiers of knowledge. It is good news that we are part of it and it will definitely work hand in glove when it shows up on university campuses or in labs alongside people funded by UKRI, and there will be cross-fertilisation. We can influence and talk to Ministers about it, and make sure it fits well with the overall envelope that we are putting around the innovation ecosystem. I would regard who it reports to, because of the way I think about these things, as secondary.

Q75 **Chair:** Thank you. Are there any other questions in the room? We have not kept you for seven hours, but we have kept you for two hours, and we are very grateful for your answers to a very wide-ranging set of questions. The Committee will meet to consider its report, but we are very grateful for your attendance and your willingness to answer the Committee's questions.

Sir Andrew Mackenzie: Thank you very much, Mr Clark. If I may say so, of course I hope that you recommend me. I would look forward to getting to know all of you on the Committee during my tenure and working with you. I have no doubt that that will be a very important part, in answer to one of the earlier questions as to how I can learn to work across Government.

I really appreciate you taking the time to consider this so deeply. It shows enormous credit to you about the thing that I believe very deeply in—that the future of the country is strongly linked to the future of UKRI and making it "I" and "R", so thank you.

Chair: Good. That is a sentiment that unites all members of the Committee. We are champions of science and technology. We want it to succeed, and this is, as you say, a very important appointment, which is why we want to give it full consideration. Thank you very much indeed. That concludes this meeting of the Committee.