

# Public Accounts Committee

## Oral evidence: Support for innovation to deliver net zero, HC 1331

Thursday 15 June 2023

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Members present: Dame Meg Hillier (Chair); Olivia Blake; Sir Geoffrey Clifton-Brown; Peter Grant; Anne Marie Morris.

Peter Gray, National Audit Office, Rebecca Sheeran, Executive Director, National Audit Office, and David Fairbrother, Treasury Officer of Accounts, were in attendance.

Questions 1 - 80

### Witnesses

I: Jeremy Pocklington CB, Permanent Secretary, Department for Energy Security and Net Zero; Dr Damitha Adikaari, Director for Climate Science and Energy Innovation, Department for Energy Security and Net Zero; Sarah Munby, Permanent Secretary, Department for Science, Innovation and Technology; Steve Field, Director for Climate, Environment and Energy, HM Treasury.

## Examination of witnesses

Witnesses: Jeremy Pocklington, Dr Damitha Adikaari, Sarah Munby and Steve Field.

**Chair:** Welcome to the Public Accounts Committee on Thursday 15 June 2023. As we all know, the UK Government have pledged to reach net zero carbon emissions by 2050. We have been looking at this a lot on this Committee and we know that the target is hugely challenging and requires technical innovation in many areas. In 2021, the then Department for Business, Energy and Industrial Strategy, also known as BEIS, published its net zero research and innovation framework, which outlined all the research and technologies needed to decarbonise the economy and identified some of the challenges, priorities and timescales for that.

We are wanting to look again at that work with the now two Departments responsible for this. It will become apparent as we go through, I think, where the responsibilities lie. I would like to welcome our witnesses. We have Jeremy Pocklington, the Permanent Secretary at the Department for Energy Security and Net Zero, who is joined by Dr Damitha Adikaari, the director for climate science and innovation at the Department.

We also have another Permanent Secretary, Sarah Munby, who is now the Permanent Secretary at the Department for Science, Innovation and Technology, but, until it was reorganised, was the Permanent Secretary at BEIS, the Department for Business. Steve Field is the director for climate, environment and energy at HM Treasury. It sounds like you are ruling half the world, Mr Field, but let us hope that we can get some good answers from you today, which is obviously critical, because the cost of doing this is significant, but the cost of not doing it is even worse. If we get it right, it is a great opportunity.

Before we go into the main session, I wanted to pay tribute to Peter Gray, who is one of our fantastic supports at the National Audit Office, where he has been a director for a number of years. He is one of the longest-serving members of the National Audit Office. He joined in 1985, one year after it was actually formed in its current format. He has delivered over 70 value-for-money studies for Parliament and this Committee and served under five Public Accounts Committee Chairs. One of his first value-for-money studies was working on the subject of the 1988 sale of British Leyland to British Aerospace, which some people watching or listening might not even have heard about, because British Leyland seems like a long time ago.

We want to pay tribute as a Committee, because Peter himself has been great fun to work with, which is perhaps not what most people think about this Committee, but we have great conversations when we are preparing for our work. He is, as you would expect from the National Audit Office, fantastically insightful on his subject, and he really understands what we as Members need to hold you all to account on behalf of the British taxpayer. I want to put on record my tribute to Peter Gray for all the work he has done and wish him well in retirement. I



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should warn him that the previous director who resigned was, six weeks later, snapped up by another Select Committee as a special adviser, so watch this space. I warn our witnesses that he may not yet be gone for good, depending on what he decides to do.

**Sir Geoffrey Clifton-Brown:** As deputy Chair, I have been on this Committee for nine years, on and off. I remember Peter from my first stint on this Committee at the beginning of the 2000s as a man who was always incredibly kind and courteous. Nothing has ever been too much trouble, Peter. Not only have you had great long service with the NAO, but you are incredibly knowledgeable. Nothing is too much trouble.

An example of that, Chair, that you will not know, is that I asked in a private briefing a number of questions and a detailed letter has already come back. There will be some questions from that detailed letter. Peter, may we thank you very much for all your long service and wish you very well in your future, whatever that brings? I hope you have many years of happiness to come.

**Chair:** I see some sighs of relief from witnesses that Peter Gray will not be helping to prepare us in future. As we all know, there are another 950 people who are hoping to emulate Peter's excellent service, so thank you, Peter. Before we go any further, Ms Blake has a declaration of interest to make.

**Olivia Blake:** My husband is currently providing services to a community energy co-op, Sheffield Renewables, in the form of secretarial support.

**Chair:** Ms Blake has a question to ask before we go into the main session.

Q1 **Olivia Blake:** My question is to Mr Pocklington. Welcome to the witnesses this morning. I would like to ask whether Mr Pocklington is able to shed any light on where things are heading with the hydrogen levy. The Energy Bill is currently passing through Committee stage; I am a member of that Committee, to be clear. It has been a bit confused with some statements that have been made by the Secretary of State this week. Would you be able to enlighten us on where the hydrogen levy is going?

**Jeremy Pocklington:** You are factually correct in terms of the Energy Bill going through Committee. Our Ministers have said they are aware that comments have been made and there is a debate happening around the hydrogen levy. They have said they are listening to concerns that have been raised and considering what is the right approach to take. That is the process that is under way. This is a normal part of the consultative approach to legislation that happens as it passes through Parliament.

Q2 **Peter Grant:** Mr Pocklington, earlier this year the Government invited proposals from energy companies to run a large-scale pilot of hydrogen power for domestic consumers in the hydrogen town pilot. We expected an announcement on the results of that process in March; it has not happened yet. Can you give any indication as to when an announcement is likely to be made?



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**Jeremy Pocklington:** I do not have a specific time to give you on that. We received four applications, I think, in relation to the hydrogen heating pilot. We are considering those applications and will set out our approach as soon as we can. I am aware of the importance. I am very happy to write to the Committee as soon as I have a timescale on that.

**Q3 Peter Grant:** In the light of the way some of the Secretary of State's comments have been reported over the last few days, are the Government still fully committed to running this pilot and learning lessons from it?

**Jeremy Pocklington:** He has been absolutely clear about the importance of running the pilot to understand the role that hydrogen can play in heating. He is also aware that the wider debate around the role of the hydrogen economy is one that continues to evolve. He has made his position clear on that specific question.

**Chair:** We will look forward to hearing about all that. It is very pertinent to today's session on how we are going to deliver net zero.

**Q4 Anne Marie Morris:** Can we turn first to the net zero research and innovation framework? Generally, that has been incredibly well received. We have our seven categories and 31 research areas. At any point was there consideration as to leaving some of those off? Or are there things that you thought about and would have added if you could have done?

I put that in the context that this is an international problem, rather like covid. We cannot do all the research in the UK; we need to do what we can around the world. Clearly, there is expertise in other parts of the world in some of these areas. There will always be a balance between the extent to which we want competitive advantage so are going to put the money into it, and, against that, the reality of a limited resource and what is going on elsewhere. With that background, what would you have excluded and what might you have included in the framework as it is?

**Jeremy Pocklington:** That is a very good question. We are very cognisant that we are operating in an international environment. That is beneficial to us, but there is also an element of competition that comes from that. The framework is, as you alluded to, a very broad framework, and that reflects the whole-economy transition that we have. That is why we have 115 programmes. It is a big, complex transition affecting many sectors of the economy.

When designing that framework, we looked at where our comparative advantage was as a country. That reflects some of our knowledge and expertise in, for example, the oversight of systems and digitalisation—the sorts of things that the Energy Systems Catapult is doing. It reflects where we think that our industry may have a comparative advantage as well. Floating offshore wind might be an example of that.

We were also very mindful of the international environment and where other countries are going to lead the research and deployment that leads to cost reduction. A lot of the cost reduction in, for example, solar PV



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actually happens from research elsewhere. Although we can add some value in this country, it will not be the main area of our focus here. It very much is a factor that has guided the work of the Net Zero Innovation Board.

- Q5 **Anne Marie Morris:** Is there a global grid—"This is what we in the UK are doing and this is what is going on elsewhere"—so that you get a picture globally, given that we are all going to need to have the technology to fix climate change?

**Jeremy Pocklington:** We play a big role in this. Mission Innovation is the global programme that brings together scientists and expertise across the world as a process to help the world to stay within 1.5. That is the co-ordination mechanism globally. It is the same experts in the Department, including Dr Adikaari, who are helping support that work as are supporting our domestic efforts.

- Q6 **Anne Marie Morris:** How important is our seat at the table? Do we have a senior seat at the table?

**Jeremy Pocklington:** We have an important role. I do not know whether Dr Adikaari would like to say anything about Mission Innovation.

- Q7 **Chair:** Dr Adikaari, do you want to paint a bit more of a human picture of what goes on?

**Dr Adikaari:** Mission Innovation is an initiative with 23 countries and the European Union.

**Chair:** It is 23 countries and the European Union on top.

**Dr Adikaari:** The European Commission is a contributor. That was launched after the 2015 Paris agreement. This is now in the second phase of mission innovation, driving innovation necessary for net zero. The seven areas that we have focused on through an extensive process are also quite relevant to what Mission Innovation has taken forward in a global sense.

The investment by the 23 countries and the European Commission covers about 90% of global public sector investment when it comes to research, development and innovation related to net zero. Its main approach tool is using seven missions to drive progress. Those seven missions are power, hydrogen, low carbon shipping, industry, carbon dioxide removal, biomaterials and energy, and cities. You can see the seven sectors we have where we have focused on UK capability, UK advantage and the potential contribution to UK carbon budgets. The work internationally sits quite well within the overall strategic approach when it comes to public sector investment necessary to achieve net zero.

- Q8 **Anne Marie Morris:** That was very helpful, thank you. All these seven categories and 31 research areas do not carry the same level of risk in terms of how achievable they are. I am almost surprised—maybe you will tell me that it exists and we just have not seen it—that there is not, alongside the lovely diagram in figure 1 setting out the seven and the



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lovely diagram in figure 3 setting out the timeline, another column that sets out the risk attached to each of these. I would be interested to know whether there is; if there is not, why not? What will you do if one of these, in the next five years, proves to be something that cannot be followed up because it is not viable?

**Jeremy Pocklington:** Each programme will have a business case, which will have a risk statement attached to it that will need to be consistent with the Department's overall risk appetite. It is not in the Report and it is not necessarily exactly on the 31 categories here, but each programme that is being funded will need a risk statement attached to it as part of the usual business case process in my Department, where it is my Department, or in DBT—the Department for Business and Trade—or the Department for Transport if it is those Departments.

In my Department, we have set a range of our risk appetite for these sorts of activities. We have said that the range will be from medium to very high. That reflects that this is a portfolio approach. As you were alluding to, we know that some of these projects will fail. That is the nature of research and innovation. If the projects were guaranteed to be successful, the private sector might well fund them. Our assessment is that, in aggregate, the returns outweigh the risk.

That means that we will fund some high and even very high-risk projects, especially at lower-to-mid technology readiness levels—TRLs—as the engineers and scientists refer to them. We announced this week an example of that, with a small amount of additional funding for investment in space-based solar technology. That is looking at the feasibility of, essentially, the wireless transmission of energy from satellites to earth. We are deliberately taking a range of risks in order to maximise the returns, but looking at this across the portfolio.

Q9 **Anne Marie Morris:** There will be some that fail. At what point will you pull the plug and say, "It comes off this list"?

**Jeremy Pocklington:** We continuously monitor and oversee this. I might bring in Dr Adikaari to give you some more specific examples. It is a portfolio approach. This is not the first portfolio we have done. The first portfolio was in the previous spending review in the previous Parliament. We are learning from the investments that we are making in research and innovation, working out which has more potential and which has less potential, and then adjusting in due course.

Q10 **Anne Marie Morris:** You have not answered the question. Who has oversight and when is the plug going to be pulled? Who makes that decision?

**Dr Adikaari:** It is a portfolio approach underpinned by evidence and modelling to understand the impact of the technology. One of the three criteria we have used is optionality for different pathways to achieve carbon budgets. In the framework and the methodology we used to develop the framework, that additional risk that we are taking on a number of different technologies is built in.



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That is the reason why some of the work we are funding is on hydrogen for building heat and, at the same time, we have programmes such as Heat Pump Ready to understand, street by street, whether the density of heat pumps can cope and what innovation can do. There are similar examples. If you take, for example, nuclear power research, we are funding near-term objectives—clear options such as small modular reactors—as well as more research-based earlier technology readiness, such as advanced modular reactors.

In the portfolio itself, we have built in sufficient optionality to tolerate that failure. How we go about when to pull the plug is through a review process. Our expectation is that the Net Zero Innovation Board, as the strategic driver for this, is going to take on that role. This is the first framework that we have put together and put in place. In support of monitoring to make those decisions, we have the Innovation Delivery Board, which tracks the investment and at the same time reports to the Net Zero Innovation Board.

There is an expectation once the investment period nears its end. At the moment we are in the middle of this spending review period. If you look at the £4.2 billion we are talking about, at the moment we are standing those projects up. If you take the Department for Energy Security and Net Zero portfolio, it is almost fully committed; some other partners are less so.

We will get to a point where we have sufficient outcomes coming through and, in parallel, progress in the analytical aspects to understand how technologies are moving. This sector has very fast-moving technological advances, so the question you are asking is very pertinent. Therefore we have to be continuously monitoring and gathering evidence. The Net Zero Innovation Board is the vehicle to analyse that.

**Q11 Chair:** Ms Munby, you have 62 projects that you and your Department are funding.

**Sarah Munby:** It is important to say that your question is implying that, at this level of the portfolio, lots of change is going to happen. My colleagues talked about how that might work, but for a lot of these things there is a huge portfolio sitting under the individual lines here. It is not the lines where the big iteration is going to be. We are still going to be researching offshore wind. It is the projects underneath that that change and iterate.

Primarily, those individual project selections are done through the usual processes that you would see in any research and innovation system. It is peer review and project-level reviews based on experts who understand the field. The bigger bit of churn or stopping of individual things is happening within these portfolios. There are a small number on this list—we already talked in this hearing about hydrogen for heating—where there are strategic moments at which you might increase or reduce investment in an entire portfolio.



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Within all of these, there is change in projects all the time as different technologies look higher potential and start to get more investment behind them. These are different specific technologies, such as, within carbon capture, the specific catalyst or solvent that you are using. Which one is highest potential? That is all going on inside the system and, appropriately, away from direct ministerial control, because it needs to be done by experts.

- Q12 **Anne Marie Morris:** Are you telling me that at no point, whatever the results of these subprojects, will you actually say, "This is a technology that we are not going to pursue"? There are lots of question marks about carbon capture. If enough of these little subprojects come up and there is not a viable option, will you pull the plug?

**Sarah Munby:** Of course you would. That is a relatively low-probability scenario. What is interesting is what technologies will emerge, at what cost and deployable at what scale. The idea that it is going to be no technologies at any cost at any scale seems unlikely. If that was where the research was tending, you would take it off the list altogether. It is much more likely that you would end up scaling down because you were seeing less progress than you hoped, whereas on something else you had found a new avenue of exploration and needed to increase investment.

- Q13 **Anne Marie Morris:** Risk is often calibrated red, amber and green. You say that there are risk assessments for all these different bits. Is there one piece of paper that calibrates them with that traffic light system that could be put on a piece of paper or, indeed, is on a piece of paper? Dr Adikaari, you are probably more likely to know the answer to that.

**Dr Adikaari:** The place where we track the progress and the risk is the Innovation Delivery Board. The documentation that we table at the Innovation Delivery Board captures risk, represented by the separate funding body or the senior responsible owner responsible for the specific programme and their interpretation of that, based on the reporting that they have for their individual organisations.

- Q14 **Anne Marie Morris:** The Treasury clearly has a keen interest in all this because this is all about money. What is the Treasury's appetite for the sorts of risks we are talking about?

**Steve Field:** As Jeremy was saying, the reason why we are in this space is that there are market failures. That justifies putting public money into research and innovation spending. We are very clear that there are going to have to be innovations to enable our net zero transition.

The framework we have is a good one. It means that I, in the Treasury, am not making those individual judgments about which technology to invest in, because I do not know anything about them and that would be a very bad system. The system we have put in place is a good one that ensures that there is evaluation of the individual projects as they go and expert input into that process. Ahead of the next spending review, we will bring that together and look across the portfolio as a whole. We will get



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advice from the board and that will inform the decisions that Ministers take at the next spending review.

**Q15 Anne Marie Morris:** Any reduction in expenditure, or any cuts in any categories, at the end of the day, will be a ministerial decision.

**Steve Field:** Spending reviews decide the allocation of spending across Departments. The way we conducted the last spending review, which was where this pot of money was allocated, was to ensure that the work on innovation was fully embedded within our net zero strategy, the innovation framework was published alongside the net zero strategy, and that was completely consistent with SR21. We aligned the timetable for that work to make sure that we were funding the right things and that our net zero strategy in the round was properly funded.

**Q16 Anne Marie Morris:** That was very helpful. Finally—then we will leave risk—how much of what you have said is publicly available information? When you talk about these plans and the calculation of risk, is that available for the public to look at? Is that published in any way?

**Dr Adikaari:** Some of it is. Some of the investments in the £4.2 billion portfolio are Government major projects, so they are in the Government major projects portfolio. Those programmes and their risk assessments are all in the public domain. Some others are not. For example, the investments in discovery research through research councils are quite complex, wide-ranging investments where the risk perception of those investments is different, so they might not be. If you look at departmental individual programmes, there are business cases and the processes—the departmental aspects—that we follow through, but they are not all in the public domain.

**Q17 Anne Marie Morris:** Mr Pocklington, can we move on now to timeline? In figure 3, the NAO has very helpfully set out in which decade different technologies will be delivered. Clearly, there is a risk element in all this. How achievable do you think this is? How much rigour have you put into testing whether these timelines will actually work? To what extent are those timelines driven by which you think is the most important to come first and, therefore, you are going to put more effort into? How much of it is driven by the sheer challenge and the current state of the unknown for any of these technologies?

**Jeremy Pocklington:** There are lots of questions there. To answer your middle one first, absolutely, it is partly driven by what we need to do to deliver our carbon budgets and remain on track for the overall goal of net zero. We will focus more, in terms of the next five years, on technologies that we need sooner on that journey to 2050, but that is because there are feedback loops in the system that mean that our pathway and our policies reflect the technologies that are most advanced today, if that makes sense.

More broadly on timelines, the Net Zero Innovation Board advised us that we needed to rebalance the portfolio to focus more on demonstration projects now, rather than projects that were in the initial research stages.



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Secondly, on timelines, where do these come from? They come from a lot of engagement with a whole range of scientific experts. In a way, that is the bigger point to make about the research and investment framework as a whole. This is a science-led process, overseen by the Net Zero Innovation Board, chaired by the Government chief scientific adviser, with extensive engagement across the science and innovation system in this country. It is from that advice and expertise that the team have been able to draw out these priorities linked to our missions.

There is more detail around the next five years and the next 10 years. Then, inevitably, it is a higher-level road map out to 2050. That is because there is less certainty about the pathway to 2050. We have a range of possible pathways and it is not right to plan everything now into the 2030s and 2040s.

- Q18 **Anne Marie Morris:** Effectively, short term, we have heat and buildings. Long term, we have aviation and the agricultural issues. Why did we want to do them in that order? Why are we going for heating and houses first, then aviation, transport and most of the rest of it, and then the agricultural piece at the end—the biomass?

**Jeremy Pocklington:** Partly, that is what the Climate Change Committee is advising us to do through its advice. Essentially, the overwhelming principle behind that is that it is the least-cost pathway to 2050. More simply, we are doing the more feasible areas first—those that are easier to make progress on, where the technologies are closer to being ready for deployment and commercialisation.

Where are we starting? We are starting mostly with the power sector. That is actually where we start, even before we get to heat. It is power first. That is because most of the technologies are deployable today. It is also because power is so foundational to the other sectors. We are seeking to electrify transport mostly. We have talked about electrification, potentially, for heat. We have to produce the hydrogen if we are going to go down that route. Some of it will require electricity as well.

- Q19 **Anne Marie Morris:** Some of these technologies are already more developed and some are less developed. Some of them will fail. Are you going to be progressing all of them, recognising that some will go slightly faster, so that, when one of the ones you thought was going to be “bingo” fails, you have something else in the pipeline? In the bigger picture, is there any possibility that you might look at this in 10 years’ time and say, “Do you know what? We actually have the wrong decade for this particular technology”?

**Jeremy Pocklington:** The core principle is one of maintaining optionality and different pathways. That is one of the underlying principles that guide this whole framework. That is for exactly the reason that you have highlighted: there is uncertainty. There is uncertainty about technologies. There is uncertainty around cost reduction and public acceptability.



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When we are setting our overall policies and trajectories for our carbon budgets, we take quite a cautious approach to research and innovation as part of that. We are not banking on all these research and innovation projects coming to fruition. We assume some cost reduction, but we take quite a cautious approach to the benefits of innovation in setting our carbon budgets and policies. There is then review. That is the key. That is the essence of the strategy that we have: we review every carbon budget period.

**Q20 Anne Marie Morris:** Let us move on. It is not just that delivery timescale; it is also the impact that has on the way you plan for this. At the moment, you have looked at the different stages, from “good idea” to total commercialisation, and divided up the different phases. The detailed plan is only 2022 to 2025 and that is only going to take us to commercial prototype. Given the importance and the length of this journey, is it not a bit short-sighted to just look at that period without having some sort of plan for the rest? That is not least because if you want industry and the public to buy into all this, they need to nail where we are going.

**Jeremy Pocklington:** It is a really good question. We have a range of medium-term plans for achieving net zero. We have the net zero strategy. We talked at a recent hearing about strengthening our planning around the power sector and achieving a decarbonised power sector by 2035. There is a lot of connectivity between those medium-term plans and the research and innovation framework. Yes, it needs to be strengthened, but the innovation framework and the delivery plan that we have here reflects the funding that we have in SR21, the most recent spending round.

This is part of a wider series of plans. You could say, “Why do we not bring them all together and have a grand plan?” To an extent, that is what we our job is in the Department on an ongoing basis: making sure that there is that connectivity and join-up, guided by the Net Zero Innovation Board.

**Q21 Anne Marie Morris:** Everything is driven by money. I understand why. At one level we have a short-term plan, because it is what the Treasury Ministers say they will fund. From the Treasury’s perspective, there also has to be this long-term outlook. At the end of the day, it will still be money. It is not going to be in 2025; it is going to be in 2035 and that has to be on your radar. How does the Treasury look at this in terms of wanting clarity about what you are going to commit to during this spending period, but also what is appropriate or what criteria should be given to your fellow Departments to make sure we actually start the work and the shaping for future years, to get the opportunity for business well out there? It will have to invest now to play its part in 2025 to 2030.

**Steve Field:** In thinking about the spending part of our net zero strategy, we look to make sure that our spending plans for the next spending review period are consistent with that broader strategy. Spending is obviously only one lever in that strategy. There are lots of other ways that we are supporting the transition to net zero.



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Part of the work we did in the run-up to the last spending review was to think about the spending lever alongside those other levers—for example, regulation—and how they would come together to support the transition in different sectors. That is the way we tried to approach it in the last spending review. In any world, some things are going to work and some things are not. Some things will come along that look much more promising than you thought.

The next spending review gives you an opportunity to reassess your plans and think about how your next set of spending plans will support your net zero strategy. You are constantly going to be iterating your approach to get to net zero anyway, because you cannot say what the world is going to be like in 15 years' time. That is the nature of the net zero strategy and the net zero transition.

- Q22 **Anne Marie Morris:** Mr Pocklington, given that if you are to commercialise these things, it is going to be mission critical to take the investors and private sector businesses with you, how are you taking them on this journey? How are you supporting them to plan beyond 2025, which at the moment, effectively, is where your plan stops?

**Jeremy Pocklington:** Can I draw a distinction between research and innovation, and commercialisation and deployment? Our plan does not stop in 2025. Our overall plan for achieving net zero—this is really important—and the signals we are providing to private sector investors are over the medium term. That is through our ambitions we have around deployment, what we are saying about carbon capture, usage and storage, what we are saying about solar and renewable technologies, and policies such as the clean heat mechanism and the zero-emission vehicle mandate. They are creating the demand and investment signals to encourage and drive investment from the private sector.

The research and innovation component is one part of that. That is designed to unlock private sector investment in research and innovation. There is then a boundary between the research and innovation and the deployment and commercialisation. That is an important distinction. We need to do everything we can to bridge that boundary and get the feedback loops, so that we are supporting technologies with the most potential. That is how we are aiming to deliver net zero.

- Q23 **Chair:** Can you define what you mean by medium term?

**Jeremy Pocklington:** I will take power as an example because we recently talked about it. We want to achieve offshore wind by 2030. There is solar. There is the ambition to achieve a decarbonised power sector by 2035. That is the sort of time period that I am talking about. That is the sort of time period that is very useful to investors, setting out the demand signals and a sense of what the pipeline will be for deployment and commercialisation of these technologies that we are talking about here.

- Q24 **Chair:** As Ms Morris has highlighted, with a spending review process you obviously need to look at what you bin and what you carry on with. We



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have been around the block a few times on this as a Committee, certainly in my time on it. You have the Government of the day—a new Government or the same Government sometimes—suddenly deciding to change their position on something. That means that, really quickly, you can say to business, “You cannot trust Government to continue in the medium to long term.”

I think what Ms Morris has been driving at, which we have not quite had an answer on yet, is how, through this innovation programme, you are mapping that to what certainty businesses need to start doing their own work in this area, so that the two then match up and we can see these quite challenging, in some cases, programmes delivered. Some of them are quite small and they are quite niche businesses. Some will be very big things such as carbon capture.

**Jeremy Pocklington:** It is not just businesses that we are talking about here; we are talking about the innovation ecosystem as a whole in this country. It is about science and about research and innovation, particularly at lower TRL levels, if I can use that acronym.

**Chair:** What does TRL mean?

**Jeremy Pocklington:** It means technology readiness level, which is the accepted way of measuring this. At the one end here, we are talking about money that is supporting scientists in labs. At the other extreme, we are talking about heavy engineering with the oil and gas majors, deploying carbon capture, usage and storage, being an example of where we are now with that. There are lots of examples of that pull-through happening.

Q25 **Anne Marie Morris:** It is pulling rather than being driven. That is what is bothering us.

**Jeremy Pocklington:** No, it is being driven. Can I give you a very concrete example of where this is happening, because I think that that would help? I will take hydrogen. You have raised carbon capture, usage and storage. One of the clusters that we are negotiating with is the HyNet cluster in the north-west. There is a hydrogen production plant as part of that cluster. Progressive Energy is developing that plant.

The original design of that plant, what is called the front-end engineering design, was funded by a grant from the predecessor of my Department through the previous round of this in 2015. That funded the design—the up-front engineering—to ensure that that project was viable. We are now pulling that through, as a Department, to commercialisation, through our negotiation around the track-1 cluster, providing a business model through the hydrogen business model, part of a carbon capture programme, to enable that to be economic and for the private sector to invest. That is a very concrete example of pull-through from high-level R&D, early-stage engineering to something that is now approaching commercialised, first-of-a-kind deployment.

Q26 **Anne Marie Morris:** We have prototypes. Ms Munby, you of all people will be very conscious of the fact that research is only as good as, at the



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end of the day, the ultimate deliverable that has commercial viability.

**Chair:** That is only in this context, before we get lots of academics writing to us about valid research.

**Anne Marie Morris:** Yes, indeed. In this context, how are you building the pull that Mr Pocklington describes into the projects that you have? How are you looking at not just getting to prototype stage but ensuring that you have sited those businesses as investors longer term? Prototype will not deliver the outcome that we want.

**Sarah Munby:** It is worth emphasising what Jeremy said. Within any of these individual streams of work that we are talking about, there will be a policy set of levers that belong to the relevant Department that is driving end-stage deployment. Our Department's responsibility is to govern the end-to-end research and innovation system to make sure that, in a generic sense, that pull-through is happening.

What are the things that make that work? Innovate UK is part of UKRI, so links can be made within that organisation between early-stage research and commercial support. The work we do on catapults would be a good example of a funding organisation whose direct and exact job is to do that mediation between end-stage research and early-stage deployment. It is practical work where you are looking at individual projects and making sure the right set of businesses is connected to the right set of academic researchers and the right set of projects is being funded.

We were having this conversation in prepping for this hearing. Almost all the catapults across the UK have a significant contribution to make to net zero. Jeremy already mentioned the Energy Systems Catapult, but the others do as well. That is an important part of the system here.

**Q27 Anne Marie Morris:** Before we move on to the co-ordination, which I think the Chair would like to look at in more detail, can we talk about the other key stakeholder here, which is the consumer? Have you done any assessment of the impact on them, in terms of not just the finances and what they are going to have to contribute financially, but also how this is going to impact their lifestyles? Frankly, are they going to buy into this?

May I, for one moment, look at electric cars? We rolled out the electric cars before we rolled out the charging points and before we even looked at the consequence for our road network. In consequence, we now have people less interested in buying cars, so maybe we should have done it the other way around. The impact on the consumer and their buy-in is mission critical. I would like to understand from Mr Pocklington how you have looked at this whole impact assessment, the consumer, and what you need to do for there to be enough carrot in order to get them to play the part they need to play.

**Jeremy Pocklington:** That is another excellent question. Public acceptability is incredibly important. We ultimately need to encourage different behaviours. Through this programme, there are a lot of good examples of individual research programmes that have the consumer at their heart. The Energy Systems Catapult, for example, has recently been



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undertaking work looking at how heat pumps perform in houses that are very hard to insulate. That is ultimately about being able to reassure consumers that heat pumps are a viable technology in a greater range of houses.

It is not your EV example—I will come to that in just a second—but thinking about what consumers actually need must drive a lot of these decisions around research and innovation if we are going to drive acceptability. I have given you a micro-example of that. EVs are incredibly important. A lot of the work takes place in the Department for Transport, which is not actually here today. We have an extensive programme of investment. It is not research and innovation investment, but it is a very significant programme of investment expanding the number of charge points through our rapid programme and our LEVI programme as well, looking at addressing regional inequalities in charging infrastructure. We are making our investments, recognising what it is that consumers need if they are going to adopt new technologies at scale.

**Q28 Chair:** Figure 7 highlights £315 million for auto and £415 million on road transport. I am not sure exactly what innovation and research might be going on on these. Hydrogen for transport could potentially be in this area. There is still a lot of research and innovation going on.

**Jeremy Pocklington:** There is a lot in transport. That was one of the recommendations from the Net Zero Innovation Board. A lot of those will be about electric vehicles as well and making sure that, for example, charging can be two way. I could give you some examples of specific bits of work.

**Q29 Chair:** To pick up on Ms Morris specifically highlighting the consumer, if you are having to charge at home, it is difficult for lots of people.

**Jeremy Pocklington:** I will see whether Dr Adikaari has an example on that.

**Chair:** What if you had a battery that you could keep in the back of your car that was safe? We have had batteries catching fire. These are things that put consumers off, exactly as Ms Morris is saying. The consumer has to be the third leg of this stool.

**Jeremy Pocklington:** I have tried to give you examples of where that issue has driven decisions around research and innovation. I have not necessarily given you examples in that specific area. This is a very broad topic.

**Dr Adikaari:** There is quite a lot of work that is related to the consumer impact and uptake, and the potential, importantly, of consumer participation in delivering net zero. It is quite important, when we think about a transition of the power system from historically quite a reactive one to an active one, and it will depend on changing generation on the system, which is a completely different way of operating.



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In relation to electric vehicles, there is quite a bit of work that the Department for Transport has been doing in terms of deployment. The charge point programme, project rapid, and the other aspects that Mr Pocklington highlighted are progressing very quickly. In addition to that, we have looked at how we can maximise the opportunity from those technologies and create the right frameworks for consumers to partake of the additional benefits that those kind of new technologies might bring—for example, vehicle to grid, or V2X, as we say, to create new ways to provide services to the system and for consumers themselves to benefit from using their assets in an intelligent way.

The technologies are expanding pretty rapidly. Quite a few of them are driven by digital technologies. In a number of places in this programme of work there are trials and programmes to develop frameworks that will directly impact the policy making at the Department. The point to note is that the technologies are moving very fast. Therefore, the innovation investments and the learning from it need to be adapted very quickly as well.

That is one reason why some of those programmes are driven by the Department. If you take the investments that the Department for Transport is doing, some of the work is related to electric vehicles. Some of the work—for example, the Faraday battery challenge—will have an economic input from discovery research and new technologies. If you look at some of the programmes, such as zero emission road freight vehicles, that is where different options are being trialled, which the Department will need to make its decisions on.

All those have a consumer angle to them. Some of them are from a supply end, but there are quite a number of examples where the impact on consumers is tested first in the academic and model-based way, and then by considering the significance that these innovations, even though they are not deployments, could have for consumers quite carefully, and designing and publishing the outcomes.

Mr Pocklington highlighted the Energy Systems Catapult's work. That was a trial called electrification of heat, where the Government funded the installation of 742 heat pumps in a range of various housing types to understand the impact on consumers.

**Anne Marie Morris:** That is all very helpful, but doing something that is simply textbook is not the same as seeing the impact on the individual consumer in real life. I am hearing that you are considering the consumer, but technology is first. Consumer and the impact—"How are we going to get them to take part?"—is second. It seems to me that if you want the uptake, it needs to be the other way round.

Let us talk about a couple of examples. I have already explained the cars. If we had the charging points and dealt with the batteries first, we might have a lot more uptake of the electric cars, which is what we want.

A Report by the NAO on smart meters came out yesterday. We can see that smart meters are now not very popular because they do not work.



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Why did we not think about the benefits and why people should want them? At the moment, most of the benefit is for the company providing the electricity because it does not have to send out meter readers.

My constituency is rural, and many rural communities are absolutely up in arms at this idea that heat pumps are going to be the only way forward. They do not feel that they have been consulted. There are many options as to how we do that, but nobody has even asked.

Apologies, but it seems to me that those are good examples to demonstrate that the consumer, in everything you have done, is not No. 1 here. It is a tail-end Charlie. You consider it, but the technology comes first. If you actually want the thing to deliver, that is not the way forward.

**Q30 Sir Geoffrey Clifton-Brown:** Good morning, everybody. Mr Pocklington, in January 2020 the Council for Science and Technology called for a clear vision of the system needed to reach net zero to align public and private investment and individual decisions. Yet further on in the Report, paragraph 2.16 says, "DESNZ has at present no central information on the costs of administering the 115 funding programmes and, therefore, whether support is being delivered in the most efficient way".

Perhaps more damningly still, in paragraph 2.17 it says: "The complexity of public sector funding will make it hard for DESNZ and the Innovation Delivery Board to track spending". With all your great talents, both of you as Permanent Secretaries and heads of your Departments, is there not a desperate need for somebody in Government to take overall charge of net zero?

**Jeremy Pocklington:** My Department has overall responsibility for net zero and delivering our carbon budgets.

**Sir Geoffrey Clifton-Brown:** It should be you then.

**Jeremy Pocklington:** It needs to be a whole-of-Government effort. You could argue that we need to bring my Department together with transport, the wider science system and oversight of land as well, but it becomes too big. Inevitably, it is going to be a whole-of-Government effort, but my Department has overall oversight of that.

We are advised on this work by the Net Zero Innovation Board, deliberately chaired by the Government chief scientific adviser, to ensure that it becomes a whole-of-Government effort. What we have here is, in many ways, world leading. There is not another country in the world that we are aware of that has as developed a research and development framework around net zero in this way that is based on needs, is anchored in science, has a clear funding programme against it, and has clear oversight and monitoring, evaluation and review around it.

It is, though, based on the ecosystem we have in this country around science, research and innovation. That is a broad, diverse ecosystem that involves a range of bodies and groups, from research councils at one end during pure science through to the Department. Many of those research



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councils are not just doing net zero. They are doing net zero and other things.

**Q31 Sir Geoffrey Clifton-Brown:** That is a long answer—I am sorry to stop you—and you have pointed out a lot of the advantages this country has. I accept all that, but this is a highly complex landscape. Therefore, it seems to me that if industry, the research people and, above all, the consumers are to understand what it is, at the moment I do not think that any bits of that would have a full picture of how this country is going to get to net zero in 2050. Ms Munby, how are we going to simplify that and how are we going to make sure that the Government have the most effective and holistic approach possible in order to give us the best chance of getting to net zero in 2050?

**Sarah Munby:** There are a few layers in what you said there. There is the understanding of consumers of how we are going to get to net zero. There is the understanding of industry of how we get to net zero. These are firmly departmental responsibilities on which—I would say this, given my previous role—really big progress has been made over the last few years. We are very much clearer about both of those questions than we were just a few short years ago. Of course, there is more to do.

Specifically on the complexity of the research and innovation component of this, which it is important to say is one small chunk of the bigger pie, it is of course a complex system because our research and innovation system has many institutions in it. It has many different geographies. It has many different stages of research. This map alone shows you the variety of different kinds of work that are being done, be it consumer-oriented research, extremely early-stage mathematical research or very applied research.

I do not regret or criticise the fact that we have a large number of programmes here built up into a complex system to address a complex problem. What really matters is that we make it accessible and understandable for the people who need to use it. It is not about, “We have to make it simple for simplicity’s sake.”

There are examples of what we are doing on that. If I take academics, UKRI is responsible for a very large number of these programmes and particularly those that are focused towards the academic end of research. There is a whole series of work going on there, particularly under the Simpler and Better Funding programme, which is all about making it easier to find opportunities and apply for those opportunities, reducing the amount of information that you have to supply—those sorts of issues. That is of passionate importance, because that is how you make the inevitable complexity of the system behind accessible.

Innovate UK is doing very similar work for its businesses accessing innovation scheme. It just launched yesterday the latest version of its innovation hub, which brings together Government support for innovative businesses.



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**Q32 Sir Geoffrey Clifton-Brown:** We have heard at length from the two Permanent Secretaries justifying whether their individual Departments should keep doing what they are doing.

Mr Field, getting to 2050 net zero is a highly complex task. It is always going to be complex. There are a lot of spinning wheels. If we are to get the maximum chance of meeting those targets—it is still very much up in the air whether we are going to meet those targets by 2050—it is going to cost a great deal of money to the taxpayer, ultimately. Surely we should have a holistic Government policy with one person in charge, in case one particular part of those cogs is not performing as it should. After all, as Mr Pocklington said, we have a chief scientific officer. We have a chief medical officer. We have a number of other chief officers. Surely, with a task as complex as this, we should have one person in charge who is accountable to Parliament for our progress towards meeting that 2050 target.

**Sarah Munby:** If I may, we do. That is the Secretary of State for Energy Security and Net Zero, supported by my colleague Jeremy.

**Jeremy Pocklington:** I think that is what I said. Forgive me, Sir Geoffrey. I am in charge of it.

**Q33 Sir Geoffrey Clifton-Brown:** Let me ask the question. I ask the questions, Mr Pocklington, and you answer them, hopefully shortly. We have a Secretary of State in charge. What we do not have is a civil servant in charge who is able to pull all the Ministries together. That is what I am trying to get at. At the moment, you are in charge of your two Departments, watching what you are doing, but there is no one person in overall charge.

**Chair:** To be clear, Mr Pocklington, you said at the beginning that each Department has its own assessment of risk and whether it goes ahead. Sir Geoffrey is absolutely right: there is still a siloing of a lot of these projects, despite the title of your Department.

**Jeremy Pocklington:** This is like any cross-cutting issue in governance. It is a particularly important one. We have a clear Department in the lead and we have governance and oversight to drive process. I was going to outline how we also want to improve that, because I do not think that we are at the finished article yet.

The governance includes the Net Zero Innovation Board. It includes the Cabinet Committee. It includes the Innovation Delivery Board, which is tracking progress, holding other Departments to account. I do not want the Committee to have the impression that we are all sat in our individual siloes. That is absolutely not how Government work on this issue. There is probably more join-up on this issue than on almost any other issue in Government, given the importance and time criticality of the mission.

There is further to do. I want to come specifically to the point that the Committee has been alluding to. We need to continue to improve this pull-through point that Ms Morris raised earlier. I have given you very



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concrete examples of how we have done that. It would be sensible for us to go further and for each of the seven sectors in the Report to have a clearer lead who is helping to make sure there is practical, value-adding join-up from research and innovation through to demonstration project and commercialisation as well, all within this overarching governance.

- Q34 **Sir Geoffrey Clifton-Brown:** You have raised the pull-through issue. I was going to raise this a little bit later but, with the Chair's indulgence, I am going to raise it now. I have a constituent that has given evidence, ZeroAvia, which you may have heard of. It describes itself as the UK-based global leader in delivering zero emission aviation. I have visited it several times. It makes the point that Government fund innovation only up to commercial viability, but it further makes the point that having finance to scale up is becoming increasingly competitive, and increasingly competitive worldwide.

It also says, "At the same time, competing geographies—like the United States' Title XVII and Inflation Reduction Act, and comparable recent measures by the European Union—mean the UK Government risks failing to capitalise on its investment at the early stages", and failing to get companies like ZeroAvia fully to the market. What can we do about that?

**Jeremy Pocklington:** I do not want to talk too much about that specific example without being thoughtfully briefed on it.

- Q35 **Chair:** But the aviation industry is frustrated, because it thinks that it could get ahead of the game if the UK right investment was in. Aside from that one company, I have had similar contact.

**Jeremy Pocklington:** The key challenge here is that of connectivity between research and innovation and that transition to demonstration, project deployment and full commercialisation. What we are seeking to do in Government is, first of all, make sure we are identifying those barriers and tackling those barriers as it goes beyond the research and innovation stage. Those barriers are partly around finance. The UK Investment Bank has a really important role to play there along with the British Business Bank. My colleague, Mr Field, may want to say more about that.

It is also about ensuring that we have the right business models and market frameworks that enable the pull-through to happen. That could be about carbon markets or the emissions trading scheme. It is also about having the right market mechanisms to make sure this can happen. That could be contracts for difference in relation to renewables. That could be the so-called RAB model, which is essentially the regulated utility model for transport and storage, for carbon capture, usage and storage, and possibly for hydrogen as well.

We need to ensure that those feedback loops are happening as quickly and as effectively as possible. You are right that the race to net zero is accelerating in the long run. It is a good thing that there is more investment in other countries in net zero. What we need to do is to capture as much of the benefit appropriately for the UK.



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**Q36 Sir Geoffrey Clifton-Brown:** That was a long answer to demonstrate your current strategy, but clearly any Government needs to adapt to what is going on in the world. If the Americans or the Europeans are crowding out final-stage investment and this company that has had £15 million of initial investment—just to use it as an example; I am not expecting you to comment on the individual company—fails to get this product to market, but the US or the Europeans do because they fund it more towards demonstration, that is surely not a terribly sensible policy, is it?

**Jeremy Pocklington:** We are looking very closely at what is happening in the US, and also the EU's response. I know it is something that my Secretary of State and also the Chancellor are very focused on. We adapt our strategy in response to that. That was what we said when we published the Powering Up Britain plan in March as well, but obviously it is something we need to keep doing in order to maximise the benefit to the UK.

**Q37 Sir Geoffrey Clifton-Brown:** When you say "keep doing", you mean keep under review.

**Jeremy Pocklington:** Keep under review, yes. The balance here is certainty and continuity, but also sufficient flexibility to respond.

**Q38 Sir Geoffrey Clifton-Brown:** Ms Munby, what have you done to make it easier for businesses and others to navigate the complex net zero and innovation funding routes?

**Sarah Munby:** It probably builds on what I was just talking about. For businesses, the particular bit of this that we have the most direct responsibility for is the activity that Innovate UK undertakes in this area. That is the most business-facing bit of UKRI, just for those who do not know the landscape well.

In fact, I think they have just launched yesterday the latest version of their innovation hub. That is not net zero specific, because obviously lots of small business innovators are not just looking for information about net zero; they are looking to bring together the whole picture of financing, just as you were discussing, including innovation grants. That is allowing you to see the whole range of Government support that is available for innovative businesses in one place.

I do not pretend that is a panacea, but it is a useful and important step forward and it is something that Innovate UK will continue to iterate. That is the front door for helping businesses to understand the landscape.

**Q39 Sir Geoffrey Clifton-Brown:** What are you doing to assess the longer-term costs of supporting net zero technologies in this short-term budget? There are some longer-term budgets that have been indicated. The UK has set out budgets extending to 2033 and 2037. Is there not more we can do? We are talking about expenditure round to expenditure round.

Do you want to answer this, Mr Field? I am very happy for you to do so, because this involves the Treasury's policy. Ms Morris has already alluded



to this. If we are going to provide the confidence to research and then implement that research into industry, we are going to have to have a slightly longer-term financial view, or at least a longer-term indicative financial climate as to how this is going to work. What can be done?

**Steve Field:** I will come to the point on spending reviews but, listening to the conversation, we are not trying to drive the entire net zero transition from our research spending outwards. We have a strategy, and we have frameworks against which we hope the private sector will come in and do much of the transition for us.

One of the things that we do in the Treasury, for example, is provide R&D tax credits at a substantial cost to the Exchequer. That supports private sector R&D. Much of that private sector R&D, I imagine, in the years to come, will be focused on dealing with some of these net zero challenges, because there are massive opportunities for businesses if they tackle them.

Conceptually, we need to not think that it is all coming from the programmes in this portfolio and moves from there, which is why Mr Pocklington comes back to the issue of the broader framework, CfDs and the regulatory certainty we can provide. It starts with our legislative framework. All of that provides the certainty about the direction of travel that the private sector is able to invest against. Our framework is much stronger than that of many other countries.

When it comes to the issue of spending reviews, as I was saying earlier, we finance things through spending review periods. It is not in the research space, but we have just made a very significant commitment to CCUS.

**Chair:** That is carbon capture, utilisation and storage.

**Steve Field:** Yes, sorry.

**Chair:** Sorry, we are swimming in an alphabet of acronyms.

**Steve Field:** We always are. That goes well beyond this spending review period. We also have the Sizewell C programme, which goes well beyond this spending review period and well into the 2030s. It is possible to manage those longer-term programmes while coming back to the overall level of departmental spending on a three or four-year basis, which has been our practice.

Q40 **Sir Geoffrey Clifton-Brown:** I have a final question for you, Mr Pocklington, on the balance between public and private spending. If we are going to get to net zero by 2050, what sort of estimate has been made? This is the longer-term stuff. As you can see, I am a little critical of the Government for not putting more detail on the bones of how we are going to get to 2050. What sort of balance is there going to be between public spending and private spending?



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**Jeremy Pocklington:** The significant majority of investment needs to come from the private sector, but that needs to be within market-based mechanisms, exactly as Mr Field said. Research and innovation is very important, but our role in the public sector is mainly about creating the markets and the certainty in the revenue streams in order to drive that investment, whether in electric vehicle charging points or whatever. Research and innovation is only a component of that.

We have estimates. The estimates are imperfect, as they inevitably will be, but they are in the Report. The £50 billion to £60 billion of additional capital investment needed each year from the late 2020s into the 2030s gives us a sense of scale. A significant ramping up is needed. That will then need to ramp up again, but I do not have a global total with exactly the amount of investment that will be needed by 2050. There is too much uncertainty around technology pathways and costs to focus on that in detail. The ranges would be too wide.

What we need to do is, sector by sector, provide certainty, demand signals and investment signals in a very strong way. We have done some of that; I am sure there is more to do in the years to come.

Q41 **Sir Geoffrey Clifton-Brown:** Finally, Mr Field, we have talked about the complexity of the system and how it is inevitably going to need to change. Mr Pocklington says he is going to keep this international competition under review. When you get a new business case in the Treasury, you say it might come out of that pot of money or it might come out of another pot of money, but it makes navigating for potential investors extremely difficult. Can we not, when we change and introduce a new system, make sure that there is a new, clear financial pathway as to how you are going to fund those new systems?

**Steve Field:** We are trying to provide some clarity on those pathways. If you look at the latest green finance strategy, we did some sector road maps where we were trying to make it clear, for different sectors—because that is how the private sector will come at this issue—what money is available and where the support would be available. We are trying to provide more clarity about that.

Q42 **Peter Grant:** Ms Munby, I want to come back to the question of the transition between research, development and innovation, and turning it into a commercial reality. A lot of the time, your Department will be responsible for whatever part Government play in assisting and encouraging the research. When it gets to the stage that they want somebody to pick up that research and turn it into a marketable product and service, will it still be your Department that leads for the Government on that, or will it transfer to the Department for Business and Trade?

**Sarah Munby:** On the question of who leads overall on all the different levers that you need to help an innovation scale from the end of the research pipeline right into deployment, there is no one Department that has overall responsibility for that.



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There is a series of questions about funding and financing in which the Treasury has an important role. There is a series of questions about tax policy, which will be Treasury-related. There is the British Business Bank, owned in DBT, and the catapults sitting in my Department. Again, that is such a big and complex problem that many parts of Government have to act on. There is not one place that owns it.

I will take the opportunity to do a plug for the work we are doing on the science and technology framework across Government, in which one of the 10 priorities is around scaling and growing, exactly in the way that you are describing. That is an HMT lead. They are the SRO—senior responsible owner—for that topic across Government, responsible for drawing together the strands of thinking into a coherent strategy. While not all the delivery tools sit directly under HMT control, HMT has responsibility for making sure that we are coherent in that space.

**Q43 Peter Grant:** I will pass that on to you then, Mr Field. From the Treasury point of view, given the enormous complexity that has been described, sometimes you could have two different Departments effectively doing the same thing in relation to different sectors of the economy. How do you make sure that the standards of public accountability and control of public finances are maintained without the whole thing being strangled by Treasury bureaucracy?

**Steve Field:** With all these programmes, the usual accounting officer framework applies. When you are at the level of an individual project, there are SROs in Departments.

**Chair:** That is the bit that is easier to track, because it is an individual project.

**Steve Field:** As Mr Pocklington was saying earlier, this is the nature of our challenge in net zero. It is not specific to net zero, but it is particularly acute in net zero that we need to make sure that we are joining up effectively between Departments, and that is what we do. We join up very effectively in the net zero space.

**Q44 Peter Grant:** One of the issues that the Committee has looked at, particularly in relation to the funding of the defence equipment plan, which involves a lot of very long-term investment, is the question of whether the traditional one-year, cash-limited budget and a three to four-year spending review plan is fit for large-scale investment that is going to run for 10, 15 or 20 years. Maybe I should ask the other Permanent Secretaries, but are you satisfied that the way in which public expenditure is approved on an annual or multi-year basis is the correct way to do it for the kind of work that is involved here?

**Steve Field:** As I was saying before, there are many programmes in Government that extend beyond three or four years, and we manage those. It is not as though at every spending review we start with a zero base. For example, in the next spending review, we are going to have a health service and we are going to have an army.



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**Chair:** Those are very bold policy announcements, Mr Field.

**Steve Field:** You heard it here first. It is true across the piece. We do not start from zero when we come to the next spending review and we manage those programmes between spending reviews.

- Q45 **Peter Grant:** I want to finish up with you, Mr Pocklington. You made a comment earlier that this is just like any other cross-cutting work in Government—I do not know what your exact words were—but you went on to say later that it may be a bit more complex than some. One of the biggest themes that come through from a lot of the work we do is that when there are major projects that need a great deal of interdepartmental co-ordination, very often that is where problems arise. There are a lot of major IT projects, for example, where the Cabinet Office has a role and the individual Department has a role. Very often, whether or not it is a breakdown in communication, that tends to be the bit where things go wrong.

Do you appreciate that members of the Committee might not feel particularly reassured by the comment that it is just the same as any cross-cutting project in Government, which you perhaps made in order to give us reassurance? We have seen that part of Government fail so often in the past.

**Jeremy Pocklington:** I completely understand the concern whenever you hear that something is cross-cutting. Those of us in Government know that it is inevitably harder.

I can say a couple of things. First of all, not necessarily all, but almost all the individual projects that we are funding through the research and innovation programme belong to an individual body that is overseeing them. I will see if Dr Adikaari wants to correct me on that. The individual projects are being overseen by either individual Departments or individual research bodies. It is the portfolio that needs to be overseen on a cross-Government basis. That needs to be done and we are doing that.

That is why we have established the Innovation Delivery Board, which brings together the SROs. Yes, it relies on governance in each delivery body, but it pulls together all the management information.

- Q46 **Chair:** We have talked about this a lot. Crucially, is it honest? If I was an SRO in a Department and I had to go to that board, and the project that I was responsible for was not going very well, or perhaps lower down the chain a bit of research was not getting to where it should be, is there an honesty about admitting that?

**Jeremy Pocklington:** There is an honesty about it.

- Q47 **Chair:** From our point of view, a failure in this respect is not a failure if you get there early. Fail fast.

**Jeremy Pocklington:** I strongly agree with that. I will give you a personal impression from my four and a bit months in the Department. There is an honesty around our experience of this. It feels very different



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when you are involved in research and innovation projects than if you are perhaps doing something else, because you know that this is about the portfolio. It is about seeing what works and what does not work.

Finding out something that does not work is a successful outcome. You know not to keep going back to that and to try something else in future. This is a different part of Government. Some would argue that even thinking about that as a failure is wrong, and that is my personal view. You learn through this.

Success is also multifaceted and more complicated in research and innovation. This is not the same as building a road or something like that. What you learn is sometimes hard to tell in advance.

**Q48 Chair:** Also, a failure might be a failure for what it was designed for, but there might be a successful element.

**Jeremy Pocklington:** Exactly: you might learn something else. That is why we ultimately need to monitor progress and take those tough decisions, but it is about system leadership of the overall ecosystem and feeding that through into policy.

**Q49 Chair:** Who is tracking the money on this in terms of the success? If you have a project or a bit of research and, after three years, it turns out it is not worth continuing to invest in it, but there is a nugget in it that might be valuable—there is a value to that Exchequer-wise, or value to that in delivering projects—how are you tracking the money through in an overarching way?

**Jeremy Pocklington:** Can I bring in Dr Adikaari, who is on the Innovation Delivery Board and lives this on a day-to-day basis?

**Dr Adikaari:** At the Innovation Delivery Board, through the SROs, we track the existing investment and what the outputs are alongside the risk management. I think your question is that, once the investment completely delivers what it was intended to, what do you do about it?

**Chair:** Yes, or indeed if it does not deliver.

**Dr Adikaari:** Exactly, but there is learning, as Mr Pocklington said, from proving the negative. My PhD is a very good example of that. I made sure that no one ever researched the subject I have researched. I have made sure that that is the case.

As for the benefits or successful projects, there are mechanisms within those individual organisations to evaluate and understand what the benefits are, and there are mechanisms to then support them and the follow-on aspects associated with it. One example from the Department's net zero innovation portfolio is that we are providing acceleration support services for businesses, especially targeting small and medium enterprises where their ideas could be great. Some of them fail but, even if they are successful, they do not know how to take it to the next level. The Department provides services for incubation support, how to take it to the next level and creating opportunities.



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**Q50 Chair:** Where you provide that support, do you follow through to ensure that that incubation of the programme has delivered something tangible in the market that is helping our GDP, helping build the economy, and ultimately helping to raise taxes? I guess Mr Field will be counting that at the other end.

**Dr Adikaari:** It depends on the sector and what mechanism we have to follow. For example, if you take a new home installation product, there is a different route for us to ensure that that happens. Aviation might be different; the power sector might be different. There are different approaches.

What we are trying to do is to have more visibility and transparency of that. That is the whole objective of putting together the Innovation Delivery Board. There is a forum and there is clarity and transparency as to how, as a portfolio, the investment is coming through and what the outputs are.

**Q51 Chair:** Mr Field, at a spending review point, you have bids from Departments saying, "We have done some amazing work here, there and everywhere on innovation for net zero." There is a value in achieving net zero, but how are you assessing the value for money of certain approaches? How does that impact on whether you are going to continue to fund them?

**Steve Field:** Taking the last spending review as an example, the process of establishing the framework, as I say, was embedded in the net zero strategy. The judgment was made at that time that £1 billion to £2 billion a year was the right kind of level of R&D expenditure in this area. That was essentially benchmarked against comparator countries, which was how we took that view.

In trying to assess, this is the question: when we come to the next spending review, what are we trying to assess? We need to make good judgments about where we put our money, because we want the money to yield benefits for our net zero transition. We also want to make sure that it supports our economy.

Now, these are relatively small amounts of money in the context of a £2 trillion economy, and there is not a huge amount of value in trying to work out the ultimate GDP impact, because it would probably be pretty small. What you want to do is to collect the right information that supports, with expert advice from the board, a sensible allocation in future. It is the Government's ambition to continue to invest significantly in R&D.

**Q52 Chair:** We see optimism bias all the time, and that is on big projects where you can count things and see things being delivered and whether milestones are being met. It is much more esoteric with early research. A fantastic group of academics could be beavering away on something, and they might find a tiny thing that they did not expect to find and not the thing that they did, or the other way round.



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In the Treasury, you have to decide which bits to fund when Departments bid in on these things, so what kind of questions are you asking them? Are you relying on the expertise of the Departments? Or do you have people in the Treasury who can really pin it down?

**Steve Field:** When it comes to choosing individual bits of research to fund, we are relying on our Departments and on the board. The experts know which are the cutting-edge things that we should be investing our money in.

As an overall judgment, the Treasury has taken the position that R&D expenditure is good for growth. There are lots of economic studies that tell you that is the case. Higher levels of R&D spend are associated with higher levels of productivity and growth, and that is why we have been increasing, overall, the amount of money we put in.

Q53 **Chair:** You are looking at it at that macro level.

**Steve Field:** Yes.

**Chair:** That is helpful to know.

**Jeremy Pocklington:** It is worth emphasising the importance of the Net Zero Innovation Board in guiding these decisions. That changed the approach in the last spending review. It rebalanced the expenditure more towards demonstration from research and development, and increased the focus on transport as a result, based on the advice from the Government's chief scientist. Another feature of this is that it is very much science-led to support the policy mission.

Q54 **Chair:** I will come back to that in a moment. I just wanted to go back, picking up on something that Sir Geoffrey was asking earlier.

Ms Munby, there are 115 funding programmes. In the Report the NAO touches on the new innovation hubs and trying to get businesses to come in. As the NAO highlights, there were stakeholders we interviewed who told us that businesses have found it difficult to navigate all the net zero research and innovation sources of public sector funding. We look at this across the piece and not just for net zero. It is quite complex, if you are an outsider to Whitehall, to understand where on earth you go to get this. In your answer to Sir Geoffrey, you seemed to indicate that the hub approach was going to be solving this. Have you thought about trying to narrow down the total number of funds available?

**Sarah Munby:** That is something we always have to look at. I am not going to sit here and say this is exactly the perfect number of funds, but the idea that it should be five is also wrong.

Q55 **Chair:** It is more than complexity, is it not? If you are a business, a researcher or someone trying to bid for money and you are looking at this, you are saying that the hub will get you in there and direct you to one of these 115. I am not asking you to give a precise number, but 115 does seem like quite a lot to navigate.



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**Sarah Munby:** Yes, although you could argue that this is a research programme covering the transformation of every single sector across our entire economy on a generation-long timescale. This is a huge topic, and you need quite different programmes for early-stage academic research in blue-sky topics. That does not just need a different programme; it needs different skills and capabilities in the people running it versus some of the things that Jeremy is doing on really specific technologies that we need to deliver right now, where we are partnering with major industrial players. You can see across that spectrum that it is not that hard to start adding up to quite big numbers.

Q56 **Chair:** I get that. Going back to the point that Mr Pocklington was just raising about demonstration models versus research and where you balance it, the board made these decisions about this ratio back in 2021. Figure 9 and paragraph 2.18 refer to this. How flexible can you be on that? Obviously, you have the timetable of funding, so you cannot just shift completely within a funding round.

The Royal Society is one example, but there is quite a lot of evidence about businesses wanting to move from that incubator stage, if you like, to actual commercial investment. That is good for the economy but also practically delivers some of these net zero programmes, which is vital for the 2050 target.

**Jeremy Pocklington:** The funding has shifted in response to that advice. It shifted from approximately 40-45-15, in terms of percentages, to roughly a third, a third, a third in those three categories of research, development and demonstration. We have shifted our approach across the portfolio as a whole.

Q57 **Chair:** Was it reflecting the maturity of the portfolio or the pressure from businesses?

**Jeremy Pocklington:** It is reflecting where we can most add value. It is reflecting the best science advice where we can most add value with our money to bring in private sector investment to deliver net zero.

**Sarah Munby:** It is also reflecting a wider shift across the research and innovation system. It is almost a truism in policy circles to say that the UK is brilliant at doing research and not as good as it should be about commercialising it. That is why at the last SR, for example, Innovate UK's funding was increased by over 60% on the previous SR, to try to make that shift.

Apologies, but I am just going to spend two minutes on something that is really important to land. It is always true that businesses will tell you they would like to have more research at the commercialisation end of the funnel, because that is the bit that benefits them today. It is right that we have made more of a shift to it.

**Chair:** To be fair, just to balance that, it benefits them today, but also if it works—



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**Sarah Munby:** Yes, absolutely, and the shift is completely correct, but there is a reason why we invest in early-stage research as well. If we are looking at the next generation of problems, if we do not invest in that now, we will not be in a position to solve them then. That is why it is a balanced process. That is why the ratio is the way of thinking about it. It is never going to move to 0-100.

**Chair:** We have heard that the ratio has shifted. By now, we are getting to more of the later-stage projects and delivering on some of those.

Q58 **Anne Marie Morris:** Can we move on to how you are going to judge progress and success with all of this? There is not a lot of point doing it unless we get the outcomes that we have targeted. Specifically, we are looking at a carbon objective that we need to meet and an economic objective. How are you going to test each of these research areas and the work you are doing in each of them to see whether they are delivering those key outcomes about carbon and the economy that we have set?

**Jeremy Pocklington:** Should I start? I will perhaps bring in Dr Adikaari as well to give a little more detail. Of course, we will evaluate the programme. We have committed to do that, beginning in 2025. It will end in 2027.

Why will it take a while to fully evaluate this programme? Because many of these individual investments and projects will take time to evaluate properly. They are harder to measure the outcomes on. As we have discussed, they are multifaceted by their nature. At the early stages, it is often quite difficult to estimate the carbon savings that will be generated.

Yes, we will absolutely evaluate the outcomes, including the important areas that you have highlighted, but we have an ongoing process of review and deep dives, using both the Net Zero Innovation Board and the delivery board to monitor progress. For my Department's own portfolio, we also have evaluation work and monitoring in place. Dr Adikaari and his team lead that.

**Dr Adikaari:** If you just take an example, the NAO Report identified 26 individual programmes for the Department for Energy Security and Net Zero. Individual programmes have their own near-term outcomes, and outputs that drive the outcomes. We have structured how we can evaluate all of them as a portfolio. That is what Mr Pocklington was highlighting in terms of running for longer after the full investment is made and the results come through.

We do that using a set of key performance indices. We evaluate the projects first, then the programmes and then the portfolio. It is quite a structured way of how the portfolio impact would come through, but that is not the only way we ensure that we get the best learning from the overall portfolio. That is the standard evaluation approach that we use.

However, we work with this large number of projects and ensure that we have regular, timely information coming back to the Departments. That is one of the main reasons why a large number of demonstration-type



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activities are driven by the individual Departments who own the policies. We do that because that helps us to ensure that the learning can be used to advance the policies that are advancing rapidly.

If you look at hydrogen or CCUS, it is quite pertinent that the rapid advance of science, and so innovation, is regularly fed back into the policy impact. In fact, of our key performance indices, the 10th is policy impact—understanding how much impact we have had from those learnings.

There is some near-term and very tangible work. One good example is the small modular reactor design and development. We have a very clear target of achieving generic design assessment step 2 approval by the regulator.

Q59 **Chair:** For those of us who are not engineers, Dr Adikaari, can you explain what step 2—or whatever it was—means in terms of what comes prior to actual delivery?

**Dr Adikaari:** Let me try again. The small modular reactor design and development project, which is led by Rolls-Royce SMR Ltd, is going through the Office for Nuclear Regulation and the Environment Agency's regulation process. The generic design assessment is a three-step process, and step 2 is what we are in at the moment.

Q60 **Chair:** Yes, but how long is it from step 2 to deployment?

**Dr Adikaari:** The expectation is that if we deliver the outcome, which is a clear outcome, by the end of 2024, we have a very good possibility of having a first of its kind in the UK by the early 2030s. It is quite tangible. It needs quite a bit of work but, at the same time, there is a clear output and then an outcome associated with it.

**Jeremy Pocklington:** It is interesting because there is a link between the policy around commercialising deployment and the establishment of Great British Nuclear, which will be running a process for small modular reactors as well, with a process around down selection later in the year. We are providing a route forward. We will need to see what happens in the process as well, but that route to market is there as well, depending on progress.

Q61 **Anne Marie Morris:** Mr Pocklington, I suppose I am a bit concerned that you are not going to do the evaluation until 2025. It seems to me that we are already putting a shedload of money in. Right now, we absolutely need to be clear about how we are going to evaluate whether what we are doing is delivering on these two objectives. That is my first question.

Secondly, we need clarity about what is an output and what is an outcome. You are using the word "outcome" for things that most people would talk about as outputs. One of the criticisms that the NAO uses is that, while there are measurements in place, they are about outputs, not outcomes. I must admit that I have not yet heard anything to tell me that I am going to get the carbon reduction and the economic upturn that we are targeting.



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**Jeremy Pocklington:** Those are very good points, Ms Morris. What Dr Adikaari and I are trying to communicate is that, although a formal, full evaluation will take place towards the end of the programme, there is ongoing evaluation and monitoring on a continuous basis through deep dives from the Net Zero Innovation Board and the Innovation Delivery Board, monitoring progress on an ongoing basis around these programmes.

Just to be very clear, it is not the case that we are sitting back and waiting for 2025. I know that is not what you were assuming, but that is not what we are doing. It is about an ongoing cycle of learning that feeds into our work. The same people who are overseeing the programme are providing advice and technical support to policy teams as we are developing and continuing to evolve policy around the delivery of net zero.

The issue around outputs versus outcomes is a good one. It is a good challenge that we should continue to strive to do as much as we can on. The reality of a lot of these individual projects, though, is that the most practical way to consider success is around the output and whether that is achieved.

If we are talking about small modular reactors, another related technology is advanced modular reactors. We have support for the next generation of reactors. They are further away from deployment and commercialisation than SMRs, but success means understanding whether they will operate. Will we be able to switch them on? Can we extract the heat? They run at a higher temperature. How could we use that heat? That will mean success for work in that area, rather than the total carbon saving that AMRs can contribute to achieving net zero.

Q62 **Anne Marie Morris:** Thank you, that is very helpful. We had a communication using WhatsApp, but when you are reading the question it is quite hard to work out what it says, so we land up with a paper chase.

I was listening to your answer. Even you would probably accept that while measuring outputs is, as you rightly say, a necessary part of the process, we are not yet there with outcomes, but I like to hear that you recognise this as important.

Let us turn to the Treasury, because it is absolutely key here. One of the things that all this has to drive is not just the carbon piece, but UK plc has to feel the win in terms of its economic position. How is the Treasury looking at this? How is it evaluating that success? How are you looking at that outcome in financial terms?

**Steve Field:** Again, when it comes to business cases for individual projects, there will be a Green Book assessment for those. They will look at the economic case and so on, but you do not try to work out what the benefit is of the individual project. You tend to look at the benefits of R&D for the economy as a whole, because the benefits from an individual project are going to be very uncertain, for all the reasons we have been discussing.



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When it comes to the point at which we are monitoring and evaluating this, we can clearly get a sense of the economic benefits that those particular projects are generating, and there are a number of ways that you could look at that. It depends on what stage you are talking about, but there could be jobs supported, and you can look at wage premia. There are a number of ways that you can make some assessment of the economic benefits of particular projects. That is something we are going to do.

In the way that the criteria have been set up for the board, one of those criteria is to think about UK companies and support for UK companies. It is embedded within those criteria that they should be doing things that support the UK economy.

**Q63 Anne Marie Morris:** I hear what you say, and I appreciate that it is very difficult for any one project to be evaluated to see what individual impact it has, because you have a suite of R&D. That said, we have 115 pieces of work. This is the biggest piece of work that the UK Government are involved in. Surely there has to be, within Treasury, a desire to come up with a mechanism to look holistically at the impact of these 115 projects down these seven categories, to see whether it is driving what you are looking for, which is investment, more jobs and many other things that are dear to the heart of Treasury. What is the Treasury doing to take that higher-level, big-picture view? I am sure it would want to shout about it if we achieve it.

**Steve Field:** Again, that will all form part of the evaluation process for the individual projects. That will be aggregated ahead of the next spending review and, over time, we will look at the economic benefits in the round.

**Sarah Munby:** It is a nested process. If you are literally an individual research project within, let's say, a programme that is run by UKRI, you have to justify yourself to that. UKRI is looking across its 60 programmes here and evaluating them. If some are not performing, they are not going to get repeated funding.

Then you are up to my departmental level where I am, with Treasury involvement, looking at the allocation of R&D spending to UKRI versus other levers. Then you are up to Treasury spending. Each piece of the puzzle needs to justify itself up to the level of the next layer, because otherwise Steve would be reviewing thousands of individual research applications, which cannot be a good plan.

**Chair:** I think we got that from previous answers.

**Steve Field:** As Mr Pocklington was saying earlier, success here is multifaceted. If we exclude bad ideas and that makes the transition more efficient and potentially cheaper because we are pursuing good ideas, that is a good thing for the economy as a whole.

**Chair:** We are clear that failure in this area is not necessarily failure. Some research does not work; knowing that early is a good thing.



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Q64 **Anne Marie Morris:** Finally from me, all this is clearly very important to the public, because they are going to have to put their hands in their pockets. There is no such thing as money that belongs to the Government: it is all money that taxpayers have contributed. How are you going to report to them as to the success, in terms of both where we get to against the carbon objective and the state of the British economy?

**Jeremy Pocklington:** Ultimately, this needs to feed through into successive iterations of our overall net zero strategy. That is also where we regularly report on progress around our performance and delivery against the carbon budgets. Ultimately, at the top, most strategic level, that is going to be the key vehicle to provide that communication with the public and investors as to what our overall approach is and the delivery path towards net zero.

Q65 **Anne Marie Morris:** That sounds great if you are an investor but, for your average man or woman in the street, the carbon budget is not going to cut it. Are you going to do something a little more meaningful, given what you are asking everybody who resides in the UK to do to make this happen?

**Jeremy Pocklington:** That is a much wider question, really. The question about how we best influence and communicate to consumers is almost a topic in its own right.

**Chair:** We have been discussing this for well over a decade.

**Jeremy Pocklington:** How do we best engage consumers to drive decisions and behaviours? Yes, we can provide support, particularly to the vulnerable in society, but often it is best done by the Government creating market mechanisms so that the private sector is incentivised to deliver and engage with consumers in individual markets.

Q66 **Chair:** Under the “Whole systems” area of spending under figure 7 on page 37, some of those could be behavioural strategy. I do not know whether maybe Ms Munby would be best placed to identify which of those are. Does pathways to net zero cover behavioural strategy—or digital and data? Is there any behavioural strategy in this to help focus on researching that, to pick up on Ms Morris’s points?

**Dr Adikaari:** There is quite a bit of work going on looking at the behavioural interventions we could use to achieve carbon budgets or a reduction in carbon emissions. Quite a number of those programmes are at quite an early stage as well. If you look at the delivery plan, most of them are run by UKRI, but they are wide-ranging as well. Some of them are directly relevant to certain consumer sectors; others are quite diverse. There is not one specific one.

Q67 **Chair:** But behavioural strategy is being funded by some of this research money.

**Dr Adikaari:** It is, yes.

Q68 **Peter Grant:** Dr Adikaari, I just wanted to come back to the answer you



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gave to one of Ms Morris's questions about evaluation. Just to be clear, were you describing what happens to projects within your own Department's portfolio, as opposed to what happens more widely? It is an important distinction because the concern that was picked up in the NAO Report was about the fact that, although individual Departments will be doing evaluation, there did not seem to be an overarching evaluation of the whole thing. Just to be clear, you were talking about the evaluation of projects within your own Department.

**Dr Adikaari:** That is right. The key performance indices and the mechanism I set out was for the £1 billion investment from the Department for Energy Security and Net Zero. Other funding organisations and Departments have their own mechanisms of evaluation and may be diverse as to how they approach them. It depends on the level of readiness of the technologies they are investing in. It is a wide-ranging, diverse approach. The Innovation Delivery Board is the mechanism for us to ensure that there is sufficient learning from good practice and, at the same time, the overall portfolio level approach is sufficient.

Q69 **Peter Grant:** It is maybe worth putting on the record at this meeting that the NAO highlighted a number of examples of good practice within the Department. Mr Pocklington, I do not know whether you are going to cut out that page, frame it and put it on your wall.

**Jeremy Pocklington:** Credit to Dr Adikaari and the team for their work here, and the wider support from the analysts. Some other Departments have very similar approaches as well. As part of preparing for this hearing, I was looking at what the Department for Transport does, and it follows quite a similar approach to us. It is the Innovation Delivery Board that is pulling together learnings from all these evaluations.

Q70 **Sir Geoffrey Clifton-Brown:** Let me start with a simple question. Mr Pocklington, why is the British Business Bank, which is going to play a major part in financing all this innovation, not on the innovation board?

**Jeremy Pocklington:** The approach we have is that the British Business Bank and the UK Investment Bank attend some meetings, but they are not permanent members attending every meeting. They are invited when the agenda is appropriate. That is the position.

Q71 **Chair:** They are not excluded from the room.

**Jeremy Pocklington:** They are not excluded, no.

Q72 **Sir Geoffrey Clifton-Brown:** No, good. What we have not discussed this morning at all is the role of regulators. Given that this is a fast-moving scene, are the regulators going to be given a sufficiently fast-moving remit to be able to keep up with all this?

**Jeremy Pocklington:** It is a very good question about ensuring that regulatory frameworks can keep pace with the adaptation that is happening. The first thing to say is that, for my sector, Ofgem has its own budgets. It provides support to research and innovation, which is



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outside of this programme, but it is also involved and we co-ordinate with that. Ofgem has a £450 million strategic innovation fund, but there is also the question about the regulations themselves. While it is not concluded by any means, there is a big programme under way to ensure that the regulatory framework can bring forward the investment that we need, and then allow the market to develop in a way that is sufficiently flexible in order to make sure it is at least cost possible to consumers.

**Sarah Munby:** Perhaps the only thing I would add is that we are just in the final stages of completing, on a cross-Government basis, the Government chief scientific adviser's review. That was originally the Vallance review, and the work is now being taken on by Angela McLean, looking at exactly this question more broadly.

Climate and energy is one of the topics looked at within that, but there are others, such as life sciences. Across the picture, we are looking at how to make sure that the UK's regulatory system is enabling innovation. There are a huge number of facets to that, as you know, but I just thought it was worth mentioning that piece of work.

**Q73 Chair:** Does that cover all the science side of it? There are other bits of regulation.

**Sarah Munby:** No, it is specific: it is regulation; it is not science. It was led by the chief scientific adviser to provide an independent voice, but it was not science-related. It is about regulation for innovation.

**Dr Adikaari:** I just want to come in, especially on Ofgem and its role. Mr Pocklington is right that the funding is different—it is publicly funded as opposed to billpayer-funded—however, in the work the NAO did, part of that spend that the Government earmarked for the period of this spending review is included. Ofgem has a seat at the Net Zero Innovation Board as well, precisely because of the importance of the significant amount of funding that it invests, as well as the importance of the power sector and the regulatory powers that Ofgem has.

We work with other regulators as well. For example, if we think about nuclear research, we provide funding for the regulators to upskill themselves, in order to ensure that they have sufficient capability and investment to build to what is to come.

**Q74 Sir Geoffrey Clifton-Brown:** I am going to ask this question to Mr Pocklington, Ms Munby and Mr Field. Ms Morris went some way towards this. Given that this is a very fast-moving subject, and the International Energy Agency estimates that half of all carbon savings will come from a technology yet to be developed, we cannot know quite where all this is going. It is a bewilderingly complicated subject, for which Parliament, on behalf of the public, needs to hold all the wheels in Government to account.

There are and always will be so many different parts of this. There are so many different Departments and so many different budgets. Is there any way that we can bring this all together in one document, with some sort



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of milestones towards 2050, so that Parliament can see whether the Government, on its behalf, is delivering and going to reach 2050? How can we do this so that Parliament can hold all of you to account?

**Jeremy Pocklington:** Ultimately, we are going to need to think about a nested layer of plans and strategies rather than a single document. The overarching document is the net zero growth strategy. That is the Government's overall response to meeting its carbon budgets, but that is not going to give all the detail that Parliament needs, which other interested parties and businesses need as well.

Only a few weeks ago, I was here before this Committee talking about the power sector. I agreed with the NAO's recommendation that we need to bring together the multiple plans for the power sector more towards a delivery plan around the power sector. That will take time and iterations to grow, but that is a huge exercise in itself.

The research and innovation plans that we have are already pretty weighty documents. The framework itself is a weighty document. The delivery plan underpinning it is also a pretty weighty document. This is such a big, complicated area that that is ultimately how we best need to think about it. It is all underpinning the overarching approach to meeting our carbon budgets.

Q75 **Chair:** Sometimes a commentary in plain English is needed, just to say that we have invested this much in this much research and this is what did not work—to humanise this. As a number of colleagues have said, sometimes it feels very up here; it is very Whitehall; it is very research-focused. Obviously, Parliament may want to see more detail, but we need a public-facing narrative about how Government are achieving these ends.

**Sarah Munby:** I was going to go down the same path. This is a good start. Given its age, we are not quite ready to say, "This is how it is all going. This is a 2022 to 2025 document." In the area of integrated thinking about R&D and our ability to explain the priorities, this is a good example of progress.

Q76 **Chair:** Can I just pick up on carbon capture, utilisation and storage, which I first came across as carbon capture and storage back in about 2011? We have two failed programmes and one that never quite got off the ground. We are still pursuing it. It is regarded as critical by you all and by Government. It is regarded as critical by the Climate Change Committee, but it has not yet taken off anywhere in the world. Are we just going to keep throwing good money after bad on this?

**Jeremy Pocklington:** If I may, it is not correct to say that there are no carbon capture and storage projects anywhere in the world. We discussed this at a previous hearing. I was there with Mr Ibbett, who had visited and told you examples of that.

Q77 **Chair:** It is not commercially used.



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**Jeremy Pocklington:** It is correct to say that we have not succeeded in developing it yet in the UK, although the technology is proven. We are at risk of repeating the previous hearing. We have negotiations under way. We have eight projects in negotiation around the two clusters. I have talked to HighNet. We have the east-coast cluster as well.

Q78 **Chair:** We have been round that block before. What is going to be different this time?

**Jeremy Pocklington:** What is different this time, including in response to a very old NAO Report, is that we have agreed with the Treasury a £20 billion whole-lifetime budget that provides certainty around funding. It is an appropriate long-term budget for the late-stage commercialisation that Mr Field has already referred to.

**Chair:** We could go round this block again several times.

Q79 **Sir Geoffrey Clifton-Brown:** I am sure we will before it comes to fruition, Chair.

Mr Field, I want you to build on the question that I asked about how Parliament can get a handle on how we are tracking towards 2050. Of course, these documents are extremely helpful, but I draw attention again to the first sentence in paragraph 2.17: "The complexity of public sector funding will make it hard for DESNZ and the Innovation Delivery Board to track spending." If the NAO is saying that, it is very hard for Parliament, let alone the public, to track whether this £4.5 billion you are spending in this expenditure round is beginning to put us on track to achieve 2050. How can the Treasury produce a document to Parliament, so that Parliament can see, on behalf of the public, that we are on track to meet our 2050 targets?

**Steve Field:** I risk repeating what my colleagues have said. The nature of this is that it is complex. There is no getting away from that. It is a transition that involves every part of the economy. It is not a straight line that you can map out from A to B. We are converging on a point in 2050. At the moment, there are a number of different routes to get there.

Inevitably, we are going to be in a world where we have to set out a broad strategy. That strategy is going to iterate over time. Plans are going to sit beneath that broader strategy. That is always going to be the case. Can we get better at articulating that? Hopefully, as we get closer to the point we are converging on, it becomes easier anyway, but I am sure we can do more to explain and articulate this better. That is something we have endeavoured to do in this area of research through the delivery plan and so on. Can we do more? I am sure there is more we can do, but it is always going to be quite a complicated picture, I am afraid.

Q80 **Sir Geoffrey Clifton-Brown:** Again, repeating what the International Energy Agency said, half of all carbon emissions are going to be delivered by technologies not yet known. This is inevitably a dynamic process, so all of you have to think very carefully about how we can produce a document that is explainable to Parliament and the public. I agree with



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you that it will not be a linear line. We have to think very carefully about how we produce a document so that Parliament can see whether we are on track to meet those targets.

I have one final question. Are we going to meet the 2.5% of GDP target for research and development?

**Steve Field:** We have set out spending plans in the last spending review and those still hold.

**Sir Geoffrey Clifton-Brown:** That still holds.

**Steve Field:** The spending plans we have set out are the spending plans, yes.

**Chair:** We cannot push you any further on that; we have to challenge the Minister. Can I thank our witnesses very much indeed for their time, particularly on this hot and sticky day?

It is a hugely important issue that the Committee is very focused on and will obviously return to. We recognise that it is very complex. Also, it can feel like it is hard to pin down. This is why we were quite keen to have a public reporting approach that makes it easier for the public to understand, picking up on Ms Morris's points about the consumer role in this, which is obviously critical. We all have to play our part.

The transcript of this session will be available on the website uncorrected in the next couple of days. Thank you to our colleagues at Hansard for their work on that. We will be producing a report. We are cutting it fine now, but we hope it may be before the Summer recess. Thank you very much indeed.