HOUSE OF COMMONS

Welsh Affairs Committee

Oral evidence: The Cancellation of Rail Electrification in South Wales, HC 403

Tuesday 5 December 2017

Ordered by the House of Commons to be published on 5 December 2017.

Watch the meeting

Members present: David T. C. Davies (Chair); Tonia Antoniazzi; Chris Davies; Geraint Davies; Glyn Davies; Paul Flynn; Simon Hoare; Ben Lake; Anna McMorrin.

Questions 56 - 121

Witnesses

Mark Carne, Chief Executive, Network Rail, Mark Hopwood, Managing Director, Great Western Railway, and David Clarke, Technical Director, Railway Industry Association

Written evidence from witnesses:

- Great Western Railway
- Railway Industry Association

Examination of witnesses

Mark Carne, Chief Executive, Network Rail, Mark Hopwood, Managing Director, Great Western Railway, and David Clarke, Technical Director, Railway Industry Association

Q56 **Chair:** Good afternoon. Welcome, Mr Hopwood, Mr Clarke and Mr Carne, to the Welsh Affairs Select Committee for our inquiry into the cancellation of the rail electrification between Cardiff and Swansea. If you are all ready to begin, I will start off with the first question to Mr Carne. Why did the estimated costs of electrification manage to rise so quickly?

Mark Carne: First, we are comparing two different costs, which are both paper cost estimates because this is obviously a project that is not proceeding. We are comparing one cost estimate from one period of time to another cost estimate today. They are both paper cost estimates.

The original cost estimate was very sketchy. It was a very early cost estimate that was done based on historical data that was at least 20 years out of date, given that we have not done an electrification programme for 20 years. As I previously said at the Public Accounts Committee, it was not adequate for the purposes of approving a major capital investment programme. I am glad that today we have a fundamentally different process within Network Rail and the Department for the approval of major capital investment programmes.

There was a huge underestimate in the way in which the costs were put together. At that stage also, because it was a very early cost estimate, there was a lack of understanding about the complexity of the railway system and what would be involved in electrification of an old railway with a lot of Victorian bridges and so on.

Many of exactly the same problems that led to the increase in cost of the Great Western project from £1.2 billion to the current £2.8 billion are largely the same reasons. It is a failure to get the original cost estimates correct.

Q57 **Chair:** When the estimates were put before the relevant Government bodies and others, was it made clear that this was a paper exercise and that there was a strong possibility that the costs would rise or perhaps even fall, but be different from the ones that were being put forward?

Mark Carne: Absolutely. The railway is funded in five-year control periods, and when control period 5, which is the one that started in 2014 and ends in 2019, was set up, the Government had a huge ambition for investment in new projects in the railway. Over £15 billion was set aside for new railway investment. However, about 80% of that investment was in projects that were at the very earliest stages in their cost estimating, so there was a very significant amount of uncertainty about the costs.

The regulator—Network Rail is independently regulated by the Office of Rail and Road—recognised that that created a significant uncertainty for Network Rail as a regulated body, and therefore created a mechanism known as the "enhancement cost adjustment mechanism". What that basically recognised was that these costs could well be wrong and as you matured the design of the project the costs may change. The regulator would then inspect those costs and if it deemed that the reason for the cost increase was legitimate and appropriate, then it would be deemed efficient spend and Network Rail would be permitted to borrow additional money off Government balance sheet at that time to fund that investment.

What changed—and this is a critical point—was that in September 2014 Network Rail's debt came back on to the Government balance sheet. At that point in time Government said, "You cannot borrow any more money so your £15 billion, that is it". That led, of course, then to the Hendy review in 2015. We had to re-baseline the whole portfolio because this ability to borrow more money was now no longer—

Q58 **Chair:** This is very interesting because I gained the impression—perhaps others have as well—that when the costs went up from—according to the NAO report here—£1.6 billion to £2.8 billion that this all came as a great surprise to the Government. I have a sense that they blamed Network Rail for not doing the estimates properly. What you are saying is effectively you have turned round and said, "Well, okay, we will give you a very basic estimate but the cost could easily change and may very well go up. Here it is, so do not be surprised if it comes out at a fair bit more". You are giving me a slightly different impression from the one I had earlier on. Am I summing this up in a very—

Mark Carne: That is only one aspect of the increase in costs. There are a number of other aspects for the increase in costs that are explained in great detail in the NAO report into the Great Western project. The reason why the Great Western project costs so much more is because the early phases of that project were inadequately carried out.

Q59 **Chair:** The important thing for us is that you made that very clear to Government at the time that the early estimates, the £1.6 billion referenced in the NAO report, was unlikely to be the final cost, so the increase should not have come as a surprise to anyone.

Mark Carne: I think the scale of the increase was a surprise to everyone. It was a surprise to us as well because we had taken what had been previous costs and it did not seem unreasonable to think that that would be a baseline on which to cost estimate things in the future. But once you then get into the detail it is different.

I want to make this point very clearly because the evidence from Roger Ford earlier on to this Committee did not make this point. It is a critical point, and that is that the cost of these projects is directly proportionate to the amount of time that we get access to the railway each night. In the

1980s, which is the cost estimates that Roger Ford was originally referring to, the amount of access that was available to the railway was substantially different than it is today. Today we get about four hours access every night. If it takes you an hour to get to site and set up and an hour to take it down, you can see you only get two, maybe two and a half hours, of productive work a night. If I had six hours' access every night instead of four, I would be twice as productive, so the costs will be dramatically different. Access is key and the reason why we have so little access is because the railway has grown so much.

Q60 **Chair:** I would not want to be unfairly dominating this, but surely that is something that could have been foreseen.

Mark Carne: Today we would have a much better handle on that. We have a much greater understanding of exactly the impact of that on the cost of these railways. Absolutely.

Q61 **Simon Hoare:** That strikes me as being persuasive but slightly naive, if I may say so, because I cannot think of a single entity, irrespective of the scale of the project, that would effectively base a guesstimate quotation on figures that were 20 years out of date. I cannot understand how, as an organisation, knowing full well the access arrangements due to the welcome popularity of the use of the railways, why that would not have been factored into some form of inflation-proofed estimate.

Mark Carne: I agree with you. We are oversimplifying, of course, the overall complexity of the cost estimating on a job of this scale, but the fact of the matter is that if you just take the Cardiff-Swansea bit, where we have not built anything—so just comparing two cost estimates—it has more than doubled in that same period of time from £150-odd million to £433 million; virtually trebled. Clearly, the cost estimating that was done in 2009 and 2010 did not take into account the practical realities of building on the railway today in an adequate way. I cannot defend that. All I can observe is that I believe that to be the case based on the evidence that I have before me today.

Q62 **Simon Hoare:** Could you tell us why not?

Mark Carne: Sorry, why not what?

Simon Hoare: Why was it not done?

Mark Carne: I have said this before at the Public Accounts Committee—and I do not want to repeat what I just said—but at the time the emphasis on getting precise cost estimates at an early stage in the industry as a whole was not seen as being essential because there was this mechanism created under the regulatory regime to allow Network Rail to adjust the cost with the agreement with the regulator. So in a way it did not matter that much.

Of course, it does matter enormously and that is why we now have a very different process for both estimating the costs and then, critically, for reaching a final investment decision when we have confidence about the costs and we can say to Government, "This is how long it will take and how much it will cost". That was only introduced in 2015.

Q63 **Geraint Davies:** I do not agree to this at all. Mr Carne seems to be saying—he used the word it was not "essential" to have an accurate cost estimate because at the time, of course, you had the facility to borrow. Then the borrowing facility was taken away and now, unfortunately, we are in this £15 billion envelope. Surely a lot of these costs were predictable. Other people are going to go through the detail, but these were predictable costs. Are you saying that because we can no longer borrow anymore, therefore, Swansea has to lose out in terms of electrification, a combination of borrowing and ineptitude?

Mark Carne: No, I am not saying that at all. The decision to not electrify the Swansea railway line is because the benefit-cost ratio and the economic rationale for it is very poor, which I am sure we will want to come to. I think that was what was behind the decision of Government to do it rather than any overall funding constraint.

Nevertheless, in 2015 when all of the very immature planning of the control period became evident and it became absolutely clear that there was not enough money to deliver all of the ambitions of the Government, some tough decisions had to be taken about which programmes would slip into subsequent control periods because we could not do everything that had been originally estimated. But it is because those very early cost estimates of electrification schemes were imperfect. CP5 had a significant amount of electrification in it, which had not been done for 20 years. That was at the heart of the cost estimating problem.

Q64 **Glyn Davies:** This is an important area in terms of our interest. It seems, looking at this now, it would be an odd way of planning a programme of investment in rail to be taking huge financial decisions—I know this is not particularly the Government and Network Rail working together—on the basis of what you described as "sketchy proposals". It impacts on the public because it was on the basis of the sketchy proposals the Government go forward with ideas and plans and proposals, but it is so sketchy they have to then reverse them and it causes a huge amount of public disappointment when that happens.

We can listen to all sorts of reasons about why this has happened, and you have articulated some of them today and they are all quite acceptable. The one I always thought was strange was when the original proposal was put forward it did not take into account all the bridges, that a huge number of bridges were going to have to be made higher. I find it hard to understand. No more bridges have been built, they were all there before. We all knew where they were going to be. How on earth could we get to a position where we are producing an estimate that did not include the bridges?

Mark Carne: Clearly, we know how many bridges there are. That is not the issue. The issue is that the detailed costs associated with the modification to a bridge only reveal themselves when you do the detailed work. You then have to consider, "What are the different options?" When you electrify you need more room under the bridge so what are the options? You can either raise the bridge, rebuild it or you can sometimes lower the track. You may not be able to lower the track because of drainage and all the rest of it. There is a complicated amount of engineering that has to go into every individual bridge. The difficulty is: how do you evaluate the cost of that at a very early stage? To your point, regrettably, a lot of those costs were significantly underestimated.

The other point—and the critical point—is about the access and the safety standards to which we operate today, which are so totally different to those in the 1980s. Previous people have talked about the decline in engineering expertise that has allegedly occurred over the last 30 years in the rail industry. I want to put a completely different perspective to you. In the 1980s, about 30 railway workers a year died at work. We have not had a railway worker fatality on our railway system for nearly four years. In that period of time, over 100 railway workers would have lost their lives. That is an incredible testament to the railway engineers of today that they deliver that fantastic level of performance. The railway engineers of today are running a railway that has more than twice as many people using it every single day, and we run the safest railway in Europe for passengers. That is an astonishing achievement, which we should be very proud of in this country. We have the fastest growing railway in Europe, the safest railway in Europe, the most intensively used railway in Europe, and the railway engineers of today are delivering this amazing achievement.

Q65 **Glyn Davies:** I certainly, and I am sure others feel the same, have great admiration for the work that you do and the achievements. I am just trying to understand what has gone wrong in terms of pricing, which has led to a controversial decision. You made a big issue of the access, four hours at night. Can you just tell us a little bit more about it? Why do you have this much reduced access? It is a key point.

Mark Carne: Mr Hopwood will be able to shed more insight into this, but because the numbers of people have doubled—more than that since the 1980s—the number of people travelling particularly at the beginning of the day and at the end of the day is very different. If I asked Mr Hopwood to cancel the last few trains of the day, that affects thousands of passengers. In the 1980s perhaps there were very few people on those trains, so the consequences for the train operator would have been very different. It is exactly the same very early in the morning. The very early morning trains are extremely busy. Mr Hopwood, you might like to comment on this.

Mark Hopwood: There are two key points for me. The first relates to the point that Mark Carne was making about safety. The type of access that is needed today is very different to the access that would have been used previously. You can very easily have a look on the internet at pictures of electrification work taking place in the 1960s with people wearing no PPE, up ladders, on tracks next to lines that were open for traffic. The result of that is exactly as you have heard, there were a number of worker fatalities. The vast majority of the work has taken place with the adjacent railway line closed for very good safety reasons.

As you have heard, the railway has seen phenomenal growth, but the period of time where we have seen much stronger growth than any other is the off-peak leisure business. We have seen growth in commuting, we have seen growth in business travel, but it is weekend travel, it is evening travel, people travelling in their own time where the growth has been strongest.

I know many of you probably travel by train, but if you go out of Paddington on trains at 10 or 11 o'clock at night, they are often nearly full. Certainly, I confess to an interest in railways. I used to travel on trains as a child in the 1980s. I remember getting on those types of trains and they were largely empty. There has been a radical change in travelling patterns in some of those off-peak periods.

Q66 **Simon Hoare:** I think we are in danger of—forgive the pun—going down a wrong siding because I do not think anybody here is talking about wishing to be cavalier with the safety and security of your staff. What people are finding—I certainly find—hard to comprehend is that you as the experts with in-house and external advisers did not have some form of realisation, some lightbulb moment of, "Gosh, the HSE requirements have become stricter. That is good news. That equals less access to the network to do works. That means a project is going to take longer. That means the costs are going to go up. Let us think about how far they may go up and then put a detailed note alongside it to reflect that in the initial quotation".

What we are teasing out is effectively a baseline quotation predicated on data 20 years out of date and with either an unwillingness or an inability to factor in and refresh additional cost pressures, either as a result of health and safety or engineering or whatever it may happen to be. It strikes me that for a large organisation that is a rather lazy way to go about preparing a financial submission to any organisation for a project, irrespective of size.

Mark Carne: Again, I am not going to defend the practices that existed at that time of those early cost estimates because I have a lot of sympathy with the points you are making. What I can say, however, is that today we would approach this type of project, and we are approaching projects of this type since 2014-2015, in a fundamentally different way. I have said before at the Public Accounts Committee that one of the positive effects of Network Rail being reclassified, and the debt coming on to the balance sheet, is that we have had to employ what I would consider to be straightforward capital discipline about the way in which you run a major capital-intensive industry.

For major projects of this type, that means that you should not make a final investment decision, that is a commitment to deliver that project, until such time as you have done enough work to be confident about the costs. You will still have a very early cost estimate at the very earliest stages, and it will have a very significant range associated with it. You should not approve a project at that point; that is my argument. What you should do is allow the team to develop the work and then you reach a point where you now have a much greater degree of certainty, you know what you have to do, and then you can deliver it.

Q67 **Simon Hoare:** I accept that entirely, but again it seems you are inviting us to pursue a hare, which we should not be, because should that financial discipline/probity/rectitude—choose your own word—not have been in place as part of a corporate mindset irrespective of where the money was coming from, irrespective of which balance sheet it was on, irrespective of whether you could borrow or not? It just points to a slapdash approach to considering the financial implications and requirements of a major project.

Chair: That is a fair question.

Mark Carne: I do not agree with the characterisation in those terms.

Simon Hoare: Which bit?

Mark Carne: I do not think it was slapdash. I just think it was a system that led to early decisions being taken before there was adequate maturity of cost estimates. That has changed and we no longer do that. I think that is a significant improvement.

We should also recognise that the level of investment that we are now making in the railway is greater and on much more complex projects and, therefore, there is inherently more uncertainty associated with the cost estimates of those projects, which reinforces the need to spend more time being absolutely clear what it is you are going to build and how you are going to build it.

Q68 **Chair:** May I rephrase Mr Hoare's question? I am instinctively a supporter of free markets rather than nationalisation, but what you are saying to me I find surprising because you appear to be suggesting that there is greater financial probity in an organisation that is run by the Government than one that is answerable to people in the private sector who have lent it money. That I think is a summary of what you are saying.

Mark Carne: No, that is not what I would say, so forgive me if I gave you that impression. My background is I spent 30 years working in the oil and gas sector, which is absolutely a private sector business.

Q69 **Chair:** If I have missed something, tell me. What you said is that when Network Rail was taken over by the Government it was suddenly told that there was going to be much stricter control on the amount that it could borrow because that borrowing would presumably be added to the national debt. Suddenly Network Rail, now it is in government ownership, is having to be a lot more careful about borrowing.

Mark Carne: Correct. That is true, but leaping to, therefore, say that the nationalisation model is better than the private sector model is not what I was advocating. What I would say is that private sector major asset-intensive industries have extremely strict capital discipline. They rank every project. They only invest in the projects that are the most likely to succeed and be a success. They will only make the decision to invest at a time when they have reasonable confidence about the outcome. It is that discipline of ranking opportunities and then making decisions at the right time that we now are introducing in a much better way in the industry as a whole.

Chair: I see that subtle difference. We will have one last question on this.

Q70 **Geraint Davies:** Given all this capital discipline you have now suddenly adopted, in the case of HS2—which has been estimated at £55 billion—in your view, what would be the most that could possibly cost?

Mark Carne: I am clearly not involved with HS2 so I cannot possibly answer that question, I am afraid.

Chair: I think that is fair, yes.

Q71 **Geraint Davies:** But as a practitioner, could it be twice as much?

Mark Carne: I am not in a position to answer that question.

Geraint Davies: No idea at all?

Mark Carne: I am afraid I do not.

Chair: It was a good attempt.

Q72 **Anna McMorrin:** With, then, the failure to plan infrastructure work properly, as you have just described, and that this has led to delays and changes to the electrification project and cost estimates were not good enough, can I address my question to Mark Hopwood? How do you think these delays and changes in the project have affected your ability to deliver an effective service?

Mark Hopwood: Clearly, the Committee is looking at a specific piece of railway, which is Cardiff to Swansea. Elsewhere the implications have been different. The thing that has changed the game in respect of what we will be doing for our customers is the nature of the Hitachi Intercity Express train because it is bi-mode. Many years ago you either had electric trains or you had diesel trains. If you ran out of electric track, generally that meant passengers had to change trains, but that is not the case now.

The train is in traffic; we put it into traffic in October. Customers who travel on it are travelling today out of Paddington on electric mode and the train is changing to diesel mode in a seamless process that virtually all our passengers and quite a few of our staff do not even notice.

That change of traction will take place in due course. Once electrification to Cardiff is complete, that change of traction will take place in the platform at Cardiff. The same train, as a through train, will carry on from London to Swansea. The train performs very slightly worse because we have agreed with the Department for Transport to uprate the engines and to take full advantage of the engine capability whereas previously they were going to be muzzled. The difference in acceleration is there but it is not very significant.

In terms of the customer experience they will still have a through train. The maximum impact on journey times from Swansea to London is three minutes, in some cases it is less. The frequency of the train service, the on-board experience, is not affected.

Q73 **Anna McMorrin:** You are saying that the delays and changes to the electrification project have not had any impact at all on your service?

Mark Hopwood: I was quite careful what I said because this Committee has asked me to talk specifically about Cardiff to Swansea. There have been wider implications across the whole of the Great Western network around the changes to electrification. But between Cardiff and Swansea it was only ever intended that the electric traction would power one train an hour, which is the hourly service from Paddington to Swansea. None of the other trains on that route that are provided by other operators, like Arriva Trains Wales, were going to adopt electric traction. We had already decided with the Department for Transport, alongside some other changes that have been made to electrification, that all of the trains that we had on order would come as bi-mode trains. Originally, when a more extensive electrification programme was planned in England, the trains would have come as a mix of bi-mode and electric trains and they are all now going to be bi-mode.

Q74 **Anna McMorrin:** The fact that you were liable to pay, I think, £400,000 a day, was that to lease new trains that could not be used until overhead electrification was complete? Is that the case?

Mark Hopwood: The Hitachi trains that are being manufactured now were ordered by the DfT as part of a Government procurement exercise. Yes, once they were delivered and fit for traffic, the contract said the trains had to be paid for.

Q75 **Anna McMorrin:** You were paying that out even though you could not—

Mark Hopwood: Yes, but I think it is important that we do not mix a load of separate issues here. I am more than happy to broaden this debate and talk about the whole of the Great Western network, but I just want to be clear about the Cardiff-Swansea section because—

Anna McMorrin: I think this is the whole of electrification to Wales.

Mark Hopwood: If we look at some of the other implications of electrification, yes, some of the trains that were going to be electric only have been turned into bi-mode trains, but it is important to recognise there are some wider benefits for that because it gives much greater flexibility of the fleet.

Q76 **Anna McMorrin:** Can I just ask one more question of you? On your trains that go to Wales, where we speak both Welsh and English, why are there not Welsh language announcements or any notification on the trains in Welsh?

Mark Hopwood: Up until now it has not been a requirement of the franchise. It is something that we are currently exploring with the Welsh language body. The trains spend the vast majority of their—

Q77 **Anna McMorrin:** Do you mean the Welsh Government?

Mark Hopwood: The Welsh Government and the Welsh language organisation that exists as well.

Q78 **Anna McMorrin:** As a country we speak Welsh.

Mark Hopwood: Yes. So the trains spend—

Anna McMorrin: Surely you would think that it respects the people of Wales to have your trains showing the language of the country that it travels to.

Mark Hopwood: Let me finish answering the question. At the end of the day, we have a franchise from Government that stipulates a lot of things in quite a lot of detail. There has never been a requirement for us to do that. Unlike the local services in Wales, where the trains are in Wales all the time, my high-speed train fleet spends the majority of its time in England. It is running down to Penzance. It is running to Oxford, the Cotswolds, Bristol, and up until now we have taken the view that the trains are in Wales for quite a small proportion of their time. We adopt exactly the same approach that other operators like CrossCountry adopt, so this is not a unique position.

We recognise the strength of feeling of people like yourself and we recognise the world has moved on, so we are now in discussions about changing that.

Q79 **Anna McMorrin:** You would commit to now having bilingual signs and announcements?

Mark Hopwood: I am not going to commit here and now because—

Anna McMorrin: I think you can do that.

Mark Hopwood: I could do but I am not going to because I have a team of people who are busy talking to the Welsh Government and I do not want to undermine the discussions they are having. I will let them speak to the people in the Welsh Government that they are engaged with and let them do the job properly.

Anna McMorrin: I will take that as a no then.

Mark Hopwood: You do not need to take it as a no. You can take it as a, "We understand the issue and we are very much on the case".

Chair: Well explored, very good. The next question is Chris Davies.

Q80 **Chris Davies:** I am coming back to you, Mr Carne. We were talking in the last session that not many lessons were learnt from the Great Western project. Is that a fair assessment?

Mark Carne: Sorry, who said that?

Chris Davies: We were told in the last session that not many lessons were learnt from the Great Western project. Do you think that is a fair assessment?

Mark Carne: No, I do not think that is a fair assessment at all. I cannot imagine who would possibly have said that to you because it is certainly not true. I think there have been huge lessons learnt from the Great Western, as we were discussing earlier on.

The Great Western project has been the great challenge of this control period. Of all of the projects that we have had to deliver, Great Western has been the most difficult and with by far and away the biggest cost increase and, therefore, of course, has had an enormous amount of focus on why that occurred and what we have to do differently. There has been a tremendous amount learnt from it and a lot of positive things learnt from it as well.

Q81 **Chris Davies:** What have you learnt and can you tell us what those positive references are?

Mark Carne: When I came to the Public Accounts Committee before and when we did the Hendy review and we replanned the programme, we set out a series of milestones for the delivery of this project, and since then every single milestone we have delivered. I think we are still on track, with challenges, to deliver to Cardiff by the end of next year, as we promised, and within the cost envelope that we indicated. Once we are into project delivery mode, we have a fantastic team of brilliant engineers who are working night and day to deliver this very challenging project.

To me the critical lessons to learn are about the early stages in the project and the engagement with the client, the funder, about what it is they want, what the best way to deliver that outcome is, and to allow enough time to allow our engineers to do the costs before political announcements, bluntly, are made that signal that something is going to happen before anybody even realises what it is going to cost or how long it will take.

Q82 **Chris Davies:** Is that a slightly veiled dig or a very open dig at

Government when you say political announcements?

Mark Carne: No, it is not a dig. It is not a dig at all. It is just a statement of my position. One of the most important railway projects that we are currently working on is the TransPennine route upgrade between Leeds and Manchester. It is a critically important part of the Northern Powerhouse ambitions. Two years ago I made it very clear that I was not going to say how long it would take to deliver and I was not going to say how much it would cost to deliver because I did not know as we had not done the work. We come under a lot of pressure to say, "Yes, I want it by then and it must cost this much". I do not know.

What I did say is that we would do a detailed study and we would publish it in December 2017, and we will do so. Then the funders will be able to make a sensible choice about the options. You end up with a range of options and they can make a sensible choice about which option they then want to pursue. I think we have been very much living the lessons of Great Western in the way we are executing major high-profile projects today.

Q83 **Chris Davies:** What have you done to boost Network Rail's expertise in electrification itself?

Mark Carne: I can get into the details of some of the problems with this project because I think it is important.

Chair: Not too many details.

Mark Carne: I will be very brief. In this project, because the trains were bought before the infrastructure was even approved, so the end date for the project was declared upfront before we knew how we were going to build it, all of the sequencing of the early phases of the project had to be compressed and overlapped. We started the design before we had the technical specification. We were starting the construction before we had even finished the design. Things that you just would not normally do in a properly run project we were obliged to do in order to try to meet these deadlines. Those are, again, lessons that we have learnt, and Mr Clarke can talk to this as well.

A lot has been learnt about the design of these sorts of electrification systems for modern railway lines that will have significant benefits going forward because we designed this railway system very differently to the railway systems of 30 years ago. We wanted inherent reliability in these systems because with the intensive use of Britain's railways today we cannot afford to have the railway system fail and create dissatisfaction for Mr Hopwood's passengers. We have built a much more robust and reliable design system.

Q84 **Chris Davies:** Last question, Mr Chairman, and it is to Mr Clarke because he has been sitting there very quietly and very patiently.

Chair: We have more questions for him shortly.

Chris Davies: I am sure he would like to contribute now. Do you agree with what Mr Carne is saying?

David Clarke: I agree that the original estimates were immature. The design was immature. The initial programme, as Mark Carne has described, was overlapping. Design was being overlapped with delivery. There are reasons why the initial cost estimate was, frankly, wrong and hence why it increased.

Our view is it should not have increased threefold, and I think the lessons that we learn, and have learnt, would ensure that future projects do not deliver at that level of cost, we believe. That is why we have launched the RIA electrification cost challenge. We believe there are a number of opportunities that Network Rail is already using in various places. If they were deployed together, if we were doing another main line or another significant piece of railway, we would apply all the lessons that we have learnt and we would deliver at a lower cost than the outturn cost we are seeing on Great Western.

Q85 **Chris Davies:** You are confident those lessons have been learnt then?

David Clarke: Yes. Absolutely, yes. Our members and our clients have learnt a lot of lessons through Great Western, and it is our position that we want to see electrification stay on the agenda as the most effective way to run an intensively used railway.

Chair: Mr Hoare has a very quick question.

Q86 **Simon Hoare:** Yes. In earlier evidence we have heard that one of the dynamics to increased costs was a woeful appreciation of which engineering works would require planning permission or not.

Mark Carne: Sorry, which?

Simon Hoare: What bits of engineering would require planning permission or not. That is either demolishing and rebuilding structures, which may have been listed, I do not know, and so on.

Mark Carne: I understand.

Simon Hoare: Having spent some years in the planning arena, it is not the speediest of processes. What resilience do you now have both in-house and in consultancy to better advise, equip, prepare and secure planning permissions where required?

Mark Carne: In the case of the Great Western, we had over 2,000 permits that we have had to get of different types. If my memory serves me correctly, 400 of those are around species protection and then a lot are to do with listed buildings and road capacity and so on. Again, it is extremely difficult to always understand the depth of analysis that is required, the depth of feeling among local communities around certain structures, and how difficult it could be to change these bridges. There are some bridges on the Great Western Railway, and Steventon Bridge is a particularly good example, where we still do not have an agreed solution for how to change that bridge. In fact, trains are going to have to slow down in order to go under it because we have not yet reached agreement and got the permits to make the changes to the bridge that we would like. That is after four years of trying.

Some of these things can be very difficult and very challenging. We have a very skilled team of people and advisers who are helping us in these negotiations with the local authorities and the planning authorities and so on.

Q87 **Simon Hoare:** How big is your in-house team?

Mark Carne: I do not know the details. I would not want to give you an exact number, but it is a significant team.

Q88 **Simon Hoare:** Why not?

Chair: I think we are going to have to speed up.

Mark Carne: I do not think there is any lack of capability in managing this, but what I would say is that again I believe that the planning issues are serious issues that you have to get right in a project. Therefore, you need to allow enough time in the early phases of projects to get it right. On Great Western that was not done and so we end up now—

Q89 **Simon Hoare:** Mr Carne, that strikes to the heart of my point. Given the complexity, the time and the multiplicity of permits and consents you require, I am not entirely sure why, to this Committee, you could not tell us how many people you have on an in-house team who are dedicated to exploring and securing planning permissions.

Mark Carne: If I may, Chair, I would be very happy to respond in writing to this question when I have made the appropriate enquiries of my own teams.

Q90 **Ben Lake:** Mr Clarke, could I address my question to you? We were told in a previous evidence session by Roger Ford, and to follow on somewhat to what Simon has just been talking about, that the capacity of Network Rail and perhaps the greater use of the private sector's expertise should be employed for electrification projects. Is this a view that you would agree with? Would it have been the case that should Siemens or Carillion have been in charge of the project it would have progressed to greater success?

David Clarke: Those sorts of companies were, of course, involved in the project. Network Rail delivers through the supply chain through our members. I think what Roger Ford might be trying to allude to is that we would say there was a huge loss of experience in the industry after the last electrification scheme, which finished in 1992. Whether it is in the supply chain or what became Network Rail, there was very little experience, or current experience, and that had to be rebuilt. That takes time. When you are building a new team the first project does not always go well and that is part of the lessons that, as an industry, we have learnt.

Perhaps another part, and we see it starting to happen now, is that, frankly, as an industry, we rushed into the Great Western programme because of all the deadlines that have been outlined. We did not pace ourselves and plan as well as we might. The design was being developed and in parallel was starting to deliver, and the expertise within the supply chain in terms of what is best practice around the world and what is already available off the shelf was not always taken, whereas we see those opportunities now being taken. Network Rail is now using systems that are used elsewhere in the world, in Scotland, for example. There is a practical example of lessons having been learnt from the Great Western experience.

Q91 **Ben Lake:** To follow on from that, and perhaps it is also a question I can direct to Mr Carne, you talked about the loss of expertise with electrification projects. I know we have discussed to some depth about the estimations and the preparatory work for such projects. Have there been lessons learnt for the engineering side of things as well or is it just a case of improving the way that we estimate these projects?

Mark Carne: I think there is an important point behind Roger Ford's comments, if I can just amplify a bit, but let me also dispel some of the myths as well. As Mr Clarke has said, 85% of what Network Rail spends is spent with the supply chain. The idea of getting the supply chain in and they will do a better job, the supply chain is in the Siemens, Carillions, Balfours and Colases. All of the major companies are working on this project and they are all working very hard and trying very hard to do a great job.

At the heart of what I think is Roger's point—and I do agree with him on this—is that if you have a decline in expertise and experience and then you build it up again many years later, what you lose is the ability to continuously improve by just repeatedly doing the same thing time and time again and getting better and better. I think that what that argues for is a long-term strategic plan for how to invest in the railway and managing public expectation so that projects are phased according to the capability of the railway rather than other ambitions. That may lead to lower cost. It may delay projects, but it would certainly lead to lower cost projects.

Chair: We are going to have to be slightly more concise.

Mark Carne: I am sorry.

Chair: Though the detail is, of course, interesting.

Q92 **Tonia Antoniazzi:** I have a great interest in buying more trains because I travel to Swansea every week. I have to say my experience on the railway is not always a great one so I feel quite strongly about some of the things.

Mr Hopwood, you spoke about why there was a purchase of the bi-mode trains and my question is very similar. Do you think that they were ordered by the Department for Transport as a get-out-of-jail-free card or maybe, as we have heard, as a cheap way out of an embarrassing problem for Network Rail?

Mark Hopwood: No. They were originally specified because some sections of Great Western were never intended to be electrified and we never wanted to take those through-journey opportunities away. For places like Carmarthen and Cheltenham and Worcester there were never any plans to electrify. The bi-mode train was purchased to carry on serving those destinations. The balance of the order has been adjusted to give us a bit more flexibility, which I think is a good thing, particularly for our customers.

Q93 **Tonia Antoniazzi:** Do you think Network Rail would have benefitted from a more intimate collaboration with the Department for Transport over buying the trains?

Mark Hopwood: I think there is a whole load of things in the past that would have benefitted from better collaboration. Clearly, we can only control what happens in the future and what you can see now is much more collaborative working. We have joined together with the western route of Network Rail in an alliance. We are planning enhancements for our customers together. People are benefitting from that. We have just announced quite recently an upgrade to the service in Bedwyn in Wiltshire, which relies on trains and track infrastructure coming together.

The procurement of the trains was led by the Department for Transport. I think the trains are going down well with our customers so in some ways that has been a success, but it would be silly with a big project to say there are never any lessons to be learnt because very often there are.

Q94 **Tonia Antoniazzi:** The Transport Secretary has said that bi-mode trains mean disruptive work to put up wires can be avoided. If the Cardiff to Swansea electrification had gone ahead, in what ways and for how long would passengers have been disrupted?

Mark Hopwood: I am happy to pick that up.

Chair: Feel free, by the way, Mr Clarke, if you want to come in on anything.

Mark Hopwood: It is undoubtedly the case that when you are improving the railway the work to deliver those benefits is often quite disruptive. There are diversionary routes for some of the railway between Cardiff and Swansea but they are quite slow. If we divert between Cardiff and Bridgend via Barry, it is about 30 minutes on the journey time. There are opportunities from Bridgend to go via Tondu and also to use the District Line to Llanelli, but they add very substantially to the journey so people would have seen disruption. I think the benefit of the bi-mode train is that we can avoid that where there is not a very powerful case for things like electrification.

It is worth just going back, very quickly, to the 1970s where they had to change locomotives at Crewe on the Euston-Glasgow trains because the electric train went to Crewe and the diesel went forward. That added 10 minutes to the journey time and some people still think in those terms, but the bi-mode train has moved us on and we do not need to operate in that constrained environment anymore.

Q95 **Paul Flynn:** Were you instructed before you came to this Committee to make your answers as long as possible so we did not have time, including extraneous information like what happened in 1970, in order to avoid us concentrating on the main issues, which is that it appears to be that the people who took these decisions did not know their elbow from their coccyx and made mistakes that included underestimates up to £1.2 billion? This is a picture that we are painted of utter incompetence and it has all happened because of other people. Can you recall that the privatisation took place 25 years ago on the railways and essentially the scheme has been going on since then? We end up with a guesstimate on a matter of such enormous cost. Who is responsible for telling Philip Hammond and Chris Grayling to come to the House of Commons and tell us this was a good scheme, it was costed and efficient, yet it was widely out in the estimate? Surely someone should take responsibility and isn't it one of you three guys?

Chair: Just to be fair to our guests, I have allowed long answers and that is probably my fault, probably a bit too long. That is my fault so I will take responsibility for that, but I think your question is a fair one. Who is responsible for this? Perhaps each of you could offer a short opinion on that.

Mark Carne: I would accept that Network Rail is, of course, accountable for providing the funders with accurate costs to enable them to take decisions, but I think to be fair, Mr Flynn, if you go—

Paul Flynn: It is being fair.

Mark Carne: If you would let me finish—

Paul Flynn: It is that you are regarding us as a gullible group of people.

Mark Carne: No, I am not. I am asking you—

Paul Flynn: Simon has been excessively courteous to you. I do not have that facility, I am afraid. Look, for goodness sake, gentlemen, this is an awful cockup in the estimate you gave and decisions were taken. Do we give money to the railways or do we give it to the health service? Does it go to defence?

Mark Carne: Yes, and that is precisely why—

Paul Flynn: You are culpable—

Chair: Let Mr Carne answer.

Mark Carne: —when I took over this job in 2014, at the beginning of this control period, and realised the scale of the problem that we had I took immediate measures to alert the Government to the fact that we had a funding crisis. That led to a spending review within six months of the start of this control period, in September 2014, that identified at that point we had at least a £2.3 billion problem. All of this is a matter of record. It is in the Public Accounts Committee if you would like to go and look at that and within the NAO report that has extensively explored all of these matters before.

Q96 **Chair:** If you had to say one person or organisation who is to blame for that increase in cost, that £1.2 billion, who would it be?

Mark Carne: That is far too simplistic a way to think about it, I am afraid, Chair.

Q97 **Paul Flynn:** You are deliberately complicating the issue.

Mark Carne: No, I am not complicating the issue at all.

Paul Flynn: You are bringing in all this historic stuff—

Mark Carne: You are talking about history. You are talking about the cost estimates that were given five years ago, so if you want to understand why—

Paul Flynn: —after me everything is disastrous and before I came, but it looks as though you are defending the idea of privatisation, which came in in 1993. There was severe criticism from people like Robert Adley, great people who knew about the railways, forecasting this kind of chaos between the various segments of the privatised railways and it has turned out to be absolutely true.

Mark Carne: No, I do not accept your analysis of that at all. I think you are conflating multiple issues there.

Q98 **Paul Flynn:** Have you read the 1993 report of the Select Committee under Robert Adley?

Mark Carne: What I am saying is that today we run the fastest—

Q99 **Paul Flynn:** That is a no, is it?

Mark Carne: It is definitely a no, but I am also going to say to you that today we run, I think, in many respects Europe's most successful railway. It is the safest railway, the fastest growing railway. The passenger numbers have doubled in 20 years. It is an extraordinary success and we are now investing more in our railway in this country than any other country in Europe.

Q100 **Paul Flynn:** The price of the tickets? You gave us a long list of things where you were saying how wonderful you were.

Mark Carne: That is a decision for Government. With respect, Mr Flynn, that is a decision that you and your colleagues decided was not to happen on this side of the table.

Q101 **Chair:** That is a bit off electrification. To return to the original question, Mr Clarke or Mr Hopwood, could you give, in a nutshell, any person or organisation that is to blame for that increase in costs?

David Clarke: The supply chain was not involved in those initial estimates, and when contracts were awarded and the current costs were identified that would have been part of the initial cost increase. As an industry, looking back, we should have identified sooner some of the problems that were emerging and—

Q102 **Chair:** But you would not want to put your name to any particular organisation or individual or even the Government or a Minister?

David Clarke: No, I would not because effectively delivering a complex project like this is a team. There are multiple parties involved, from the funders through to the deliverers, and they all have a responsibility to raise issues when they are found and to work together to solve them.

Q103 **Paul Flynn:** So nobody was at fault. Who was it, do you think, that miscalculated the number of railway bridges on the line? There is a clue in that you have described them as being Victorian, so they have been there for a long time. Who underestimated the number of bridges? Surely this is a very simple matter. Didn't these have a vital effect on the costs?

David Clarke: I do not know because I was not—

Paul Flynn: But this is crucial.

David Clarke: —involved in that particular piece of work. Mr Carne answered earlier to say that the number of bridges was well understood but until you go and look at an individual bridge in great detail, which you do at a detailed design phase, not an initial estimate phase, then it is very difficult to know the detail.

Q104 **Paul Flynn:** It is not detail. This is a major factor in the cost with the number of bridges. I have half a dozen in my own constituency. You can tell how many bridges run through my constituency by looking at the map for five minutes. How was that missed out? You talk in this windy language about things maturing, we will have a new strategic approach; why did you not have a strategic approach when you made your initial estimate that was nearly £1.2 billion out? This was an awful cockup.

Chair: Well, there we are. I think we might just have to let that observation hang. Order, order, because I think we have to be courteous to our guests here and everyone wants to come in. A very brief one then from Simon and then a brief one from Anna.

Q105 **Simon Hoare:** Picking up on what Mr Carne said, which I take entirely, the experience lacuna that was created post privatisation, electrification and so on, one of you—forgive me, I cannot quite remember which one—

said that you had gained some expertise from something that was being done in Scotland. It strikes to the heart of what Mr Flynn was asking, which is that somebody should have recognised, "Hang on a moment, we appreciate that health and safety stuff is involved but we also appreciate that we have no direct immediate knowledge about electrification. I wonder if there is anybody out there in the railway family that we can bring in to advise, look and refresh our thinking to try to bring us up to speed". That seems not to have taken place.

Mark Carne: Certainly, it was the case that advice was taken at the time and other views were taken at the time, but clearly we run a very unique railway where the intensity of use on our railway is very different to others.

Simon Hoare: It is not unique. There are trains—

Chair: Simon, sorry, we have to continue with this.

Simon Hoare: It is not a unique railway. It is a business.

Chair: Do you want to very quickly answer that question?

Mark Carne: Every bit of railway is unique. The challenges associated with every railway are unique. There are 2,300 trains a day running on this railway. It is a very—

Chair: Okay, good. Anna McMorrin.

Q106 **Anna McMorrin:** Just very quickly, I want to know, leading on from Paul Flynn's question, how we can have confidence in you, as business leaders, running and delivering our public transport systems. How can we have this when you get it so fundamentally wrong? I do not believe we can have any confidence.

Mark Carne: I think you should have every confidence in it because, as I said earlier on, when we reset the programme in 2015 we have hit every milestone since then on this project. We are going to deliver it to Cardiff by 2018 as we said we would. I am not going to sit here and try to defend the decisions that were taken in the early cost estimating of this in 2019 under a different Government, under different pressures, many of which were political as well as railway pressures. I can try to do that but I do not think that is appropriate either. Clearly, what happened was not acceptable. That was what we discussed at the Public Accounts Committee at length. We took decisive action to fix that problem with the Department for Transport's help and assistance as well. We now run a completely different way of delivering projects and it is being successful.

Q107 **Geraint Davies:** Just briefly, can I ask Mr Hopwood what steps he is going to be taking to stop Swansea station being full of diesel fumes? At the moment, there are two trains churning away and presumably this will be the case with the bi-modals because they will be diesel. While you are at it, on consumer benefits is there any plan to enable people to have wi-fi for at least half of the trip on the new trains because it is hopeless? People are concerned about the seats being very hard. Finally, because you have removed the buffet, you cannot get a cup of tea when you want it. You have to wait a few hours for someone to arrive. Can we start off with how you are going to stop people coughing with poisonous fumes, diesel fumes, belched out of your engines?

Mark Hopwood: The emissions from the diesel engines on the Intercity Express trains are significantly less than older trains. The diesel engines will only run when they absolutely need to run. At a number of locations—I am not sure if Swansea is one but I will check—we are going to plug the trains into a shore supply, which means that we can turn the diesel engine off and supply the train with power. The vehicle that is closest to the station concourse at Swansea does not have a diesel engine anyway. The diesel engines are in the middle of the trains, so the vehicles closest to the passenger area are not polluting.

In terms of wi-fi, we recognise that the wi-fi we fitted on our existing high-speed train fleet has been welcomed by many people but is not as good as it probably needs to be to meet demand.

Geraint Davies: The current one is hopeless and the new one is no better.

Mark Hopwood: Some of it is about the quality of mobile phone reception because at the end of the day we cannot turn water into wine. We cannot turn a mobile phone signal that does not exist into a wi-fi signal. We are working with the mobile phone providers to try to improve that and we are speaking to most of them. We have made some progress, but the capability of the new Hitachi trains, I have to say, is better. There is more equipment on them. The backbone of the train is much more resilient and we are seeing improvements. The use of wi-fi on those trains has gone up, which suggests that the quality is much better, but we are more than happy to talk to you and anyone else about their experiences.

The seats, we have had lots of varying feedback. Some people like the seats, some people find them too hard, but that is not a factor unique to our new trains. It is how seats on trains are designed ergonomically these days. We have a buffet trolley on those trains, which is selling two to three times more cups of tea and coffee than we used to sell from the buffet, which suggests to me we are getting closer to the customers in giving them what they want.

Geraint Davies: But you can wait an hour for it to arrive sometimes.

Chair: We can walk up the train.

Geraint Davies: To find the buffet, to find the trolley, I suppose, yes.

Chair: The seats do seem a bit hard, though, if I may make that observation.

Mark Hopwood: Point noted.

Q108 **Chair:** Anyway, let me not dwell on that. Mr Carne, the Welsh

Government estimated that the saving on electrification between Cardiff and Swansea was £700 million, but the other figures, which I do not have to have to hand now, suggest it was a lot less than that. I think that was the one given to us last week. Have you any idea where this £700 million figure comes from?

Mark Carne: I have no idea where the Welsh Government got that figure from.

Q109 **Chair:** What would you say, is it anything like that or is it a lot less, the cost of electrifying between Cardiff and Swansea?

Mark Carne: We have not looked at this cost for quite some time so the £430 million is the last time that I had a view on it, and even that would have had a significant range on it because it was a very early cost estimate. I personally do not know where the £700 million came from.

Q110 **Ben Lake:** We have been told in the previous evidence session, and it was touched upon earlier in this session, that the potential reductions in journey times offered by electrification of the Great Western Line, particularly between Cardiff and Swansea, are quite limited but that a potential alternative route—pardon the pun—would be to straighten the lines. Would you be able to talk us through a little bit about what it entails to straighten the routes and also the potential for the reductions in the travel time between Swansea and Cardiff and further on to London, I suppose?

Chair: Mr Clarke, do you want to comment on that?

David Clarke: I cannot comment on the specifics. I do not have the detailed local knowledge, I am afraid.

Mark Hopwood: I am happy to pick that up. There has been some work done within Wales and locally, particularly in south Wales, about a Swansea Bay Metro. I know Mr Flynn does not like me talking about history, but it might be useful just to know the railway from Cardiff to Swansea was built to go via Neath because the people in Neath were very keen to have it there, but that does add quite considerable distance and time to the journey. If you were to go as the crow flies from Port Talbot straight into Swansea, with line speed improvements you might be able to reduce the journey time to as close as 30 minutes. That work has been done by a number of interested parties within Wales but, of course, building new railway lines is very, very expensive and brings all sorts of challenges. You asked the question so that is the answer.

Q111 **Geraint Davies:** To pick up on this, would you support the idea of an electrified Swansea Metro that had that realignment along the original Brunel straightened line? Have you any idea what it would cost? I know you said it would cost a lot. Some people are saying this system would cost £1 billion, but I would not know. Do you have any idea?

Mark Hopwood: I do not have an idea of costs. I have been made aware of the project and I have spoken to some of the people in Wales who have done some of the work, but I have not seen detailed costs.

One of the realities with railways is there are always far more ideas to develop than there is money to fund it, but in principle clearly I would welcome anything that improves the journeys for our customers. I know that many of our customers find the journey time to Swansea to take longer than they would like and that slight diversion at the end of the journey clearly does not help. Simply, yes, I would welcome it but equally I recognise that politicians and Government have many priorities for limited funds, so at the end of the day I guess this will have to take its place.

Q112 **Geraint Davies:** You will know that the case against electrification was built upon the idea that there was no marginal journey time saving between Swansea and Cardiff. As part of the package there was straightening of the railway to save half the time, 30 minutes, because we are only saving 15 minutes between London and Cardiff after all. Do you think that would be a powerful argument alongside the City Deal and the extra demand to make the business case for the straightening and electrification to Swansea?

Mark Hopwood: I think a project like that is unlikely to have a payback in straight commercial terms for the railway, but I recognise it would add enormous value in the wider debate around Swansea and its accessibility. Clearly, I want to be able to serve the key city flows in my business as quickly as possible, so we would support that. I would not want anyone on your Committee or elsewhere to be under any illusion. Those types of projects are very, very expensive. Lots of people around the UK would like to see similar schemes and in reality funding is limited, but clearly if you wanted to get the journey time from Swansea to London down to about two and a half hours that is the type of project that you would need to look at.

Q113 **Geraint Davies:** In terms of Wales versus the rest, Mr Hopwood is obviously aware that HS2 is going to cost £55 billion and Wales's share of that should be about £2 billion, but we are not getting it. Out of that money, in theory, we could halve the time between the two big cities of Wales and bring a lot of economic prosperity outside the railway system to south Wales at a time that we are threatened by a migration of investment from the south Wales corridor to the HS2 corridor because the time savings to get to London are so great. Would you agree with that?

Mark Hopwood: It is worth emphasising we have not spent a lot of time today talking about what we are going to do, and we are going to deliver some very significant journey time improvements, so 15 minutes will come off the journey. It is a fact that once the train from London gets to Bristol Parkway it never again reaches a speed beyond 100 miles an hour. Clearly, if there were opportunities to raise the line speed between

Bristol Parkway and Swansea that would clearly allow that journey time to come down.

Q114 **Ben Lake:** Very briefly on that point, what are the factors that limit the maximum speed that the trains are able to travel? Is it restrictions of the track or that there are too many bends and turns?

Mark Hopwood: The key factors for us are what you have just mentioned, so obviously the nature of the track, the curvature and, therefore, the line speed. The calling pattern of the train: we could run non-stop trains between all sorts of places but often the stations intermediately are very important for those passengers and important revenue wise. The signalling system at the moment on that route would not support trains running beyond 125, but the train we are taking delivery of from Hitachi is designed to travel at up to 140 miles an hour.

Q115 **Chair:** Let us move on our last question from history to the future. Perhaps Mr Clarke could tell us what he thinks about this idea for battery trains, hydrogen-run trains. I have even been told that sticking wires up over railway lines is just going to be dead technology in 10 or 20 years because we are going to have clean emission-free trains powered by hydrogen and batteries that will not need wires at all. Is that possible?

David Clarke: It is not as simple as that, as you might imagine. Technically, we are seeing very plausible battery train prospects out there. There have been a number of trials run. We are seeing the first fleet of hydrogen fuel cell-powered trains being ordered in Germany. They tend to be suitable for relatively short regional journeys. If we were thinking about intercity, for example, then they are not really suitable for intercity. There is quite a bit of difference between trying to haul a three-car train at maybe a maximum of 70 to 90 miles an hour as against hauling a 10-car intercity train at up to 125 miles an hour. Without going into all the physics you can imagine the difference in energy involved.

There are undoubtedly plausible technical solutions particularly for the more local traffic, but it is not a silver bullet. We would maintain that pure electrification, if you like, is the optimum solution for an intensively used railway, but you now have different options. We have already explored the diesel bi-mode, which is today's plausible option for going off the end of the wires. It allows you to offer a through journey. At the risk of going back in history, the solution when the east coast was electrified was a third of the fleet had to be diesel in order to serve stations beyond Edinburgh, Inverness and Aberdeen, and those diesels ran all the way, and still do, from London to Edinburgh as diesels under the wires. The bi-mode gets you out of that. You can put the bi-mode on east coast. You can run it as an electric train to Edinburgh.

In what is available today we can see diesel bi-modes you can buy and they give you that flexibility for a long-distance, high-speed train. We can see in Germany they are buying hydrogen fuel cells for regional trains. Interestingly, they are replacing diesels so the approach they are taking is to take the diesels out of the mix because, as you probably understand, the proportion of electrification on the European mainland tends to be much higher than we find in the UK.

Q116 **Geraint Davies:** I did ask Mr Hopwood, but can I ask two questions, one of Mark Carne as to whether he is aware of the scheme to straighten the line as we mentioned earlier and whether he had any idea of the costs? Again, following on from what David Clarke has said, what is being said is we could have had a system where the centralised system was electrified and the peripheral system was hydrogen with the change as opposed to bi-modal and keeping diesel going at a time when the long-term future of diesel and concerns about pollution and the environment are growing.

Mark Carne: Maybe I can make a more general comment if I may. In a way, the old-fashioned conversation is the wrong conversation because what we are discussing now is railway engineering rather than railway outcomes. What I think we should try to do with our funders is to say, "What is the outcome you want from railways? How much faster do you want people to get between Cardiff and Swansea? What is the economic value associated with that improved journey time for that number of people?" Then allow us to go away and think about what the right way to achieve that outcome is.

Q117 **Geraint Davies:** How much would it cost to straighten the line?

Mark Carne: I do not know, but what I would say to you is, first, what is the economic value that would be created as a result of that improved journey time?

Q118 **Geraint Davies:** It would halve the journey time, that is what we know, and there is a City Deal. I am just asking about costs and benefits first.

Mark Carne: If we know that, if we know that that is a particular requirement of stakeholders to have an improved journey time, then we can look at all the different options that could achieve that. There may be a number of different options that would achieve that outcome.

Q119 **Geraint Davies:** Yes, I know that, but do you know the cost of straightening the line to save the 30 minutes is what I was asking.

Mark Carne: No, I do not know the cost.

Q120 **Geraint Davies:** What about the question about having this whole new system of electric with peripheral hydrogen? If I understood David Clarke, because that is what he said, it is a vision of the future. Have we avoided doing that in Britain now by going to dirty diesel for the future?

David Clarke: As Mark Carne has just described, you need to tell us as an industry what you want to achieve. As I described earlier, at the moment hydrogen fuel cell trains are most suitable for regional traffic. If you wanted to reduce the journey time for people travelling between Cardiff and Swansea, that might be something well worth looking at.

If you, on the other hand, wanted to not have a diesel bi-mode, as I have described earlier, then the technology is not yet up to operating an intercity train. You are inviting us, potentially, to fall into the trap that you criticised us for earlier of trying to develop a scheme and offer you a price before we have properly studied it. If we understood the objective, if it is 30 minutes off journey time because that has huge economic benefits for the region—and I could see how it would because you are highlighting what railways can bring to the economy. Back to the Victorians, at the risk of getting back into history, railways have driven the UK's economy. You are highlighting a potential there in the Swansea area, but we cannot give you off the cuff answers. We would need to go away and do the work properly otherwise we will fall into the trap.

Q121 **Geraint Davies:** Can you do that? Can you write to us with some estimates?

David Clarke: I could not because that is not something that we would do as a trade association, but I am sure that through the proper channels if the industry was asked to do that, of course, we could.

Mark Carne: We have a very formal process by which this sort of thing is done. It is the route studies. The route studies are co-ordinated by Network Rail. They involve input from the train operating companies, from the supply chain and, most importantly I think, from the communities that the railways serve, where we look at what it is that the communities want in terms of journey time, frequency, capacity and so on. Then we set out a series of options for how those outcomes can be achieved and that is the start of the funnel of then determining what the best projects are to invest in for the railway industry as a whole. There clearly is a current route study for the Welsh railways and I would be very keen to ensure that these ideas are incorporated within that and studied appropriately.

Chair: I think we should end on that positive note. Mr Carne, Mr Clarke and Mr Hopwood, thank you all very much indeed.