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Official Report

ECONOMY, ENERGY AND TOURISM COMMITTEE

Wednesday 22 April 2015

Session 4

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ECONOMY, ENERGY AND TOURISM COMMITTEE
11th Meeting 2015, Session 4

CONVENER

*Murdo Fraser (Mid Scotland and Fife) (Con)

DEPUTY CONVENER

*Dennis Robertson (Aberdeenshire West) (SNP)

COMMITTEE MEMBERS

*Chic Brodie (South Scotland) (SNP)
*Patrick Harvie (Glasgow) (Green)
*Johann Lamont (Glasgow Pollok) (Lab)
*Richard Lyle (Central Scotland) (SNP)
*Gordon MacDonald (Edinburgh Pentlands) (SNP)
*Lewis Macdonald (North East Scotland) (Lab)
*Joan McAlpine (South Scotland) (SNP)

*attended

THE FOLLOWING ALSO PARTICIPATED:

Stuart Bradley (Energy Technologies Institute)
Elaine Hanton (Highlands and Islands Enterprise)
Tim Hurst (Wave Energy Scotland)
Neil Kermode (European Marine Energy Centre)
Lindsay Leask (Scottish Renewables)
Dr Stephen Wyatt (Offshore Renewable Energy Catapult)

CLERK TO THE COMMITTEE

Douglas Wands

LOCATION

The James Clerk Maxwell Room (CR4)

Scottish Parliament

Economy, Energy and Tourism Committee

Wednesday 22 April 2015

[The Convener opened the meeting at 10:03]

Decision on Taking Business in Private

The Convener (Murdo Fraser): Good morning, ladies and gentlemen, and welcome to the 11th meeting in 2015 of the Economy, Energy and Tourism Committee. I welcome all members, our witnesses—who I will come to in a moment—and anyone joining us in the public gallery. I remind everyone to turn off or at least turn to silent all mobile phones and other electronic devices so that they do not interfere with the sound equipment.

I formally record the committee's thanks to our former assistant clerk, Diane Barr, who has left the committee to work for the non-Government bills unit. Diane was with the committee for a number of years. We all appreciated her efforts and her cheerful support for the work of the committee over that time, and we wish her all the best in her new role. I welcome Ailsa Burn-Murdoch—she is not here at the moment; she was here a second ago—who joins us from the Equal Opportunities Committee as the new assistant clerk.

We now move to item 1 on the agenda. Do I have the committee's agreement that we take item 3 in private?

Members *indicated agreement.*

Marine Energy

10:05

The Convener: Under item 2 on the agenda, we are taking evidence on the future of marine energy in Scotland. We have a large and distinguished panel joining us today. I ask the witnesses to introduce themselves and to say which body they represent and how it fits into the broad marine energy picture.

Neil Kermode (European Marine Energy Centre): Thank you. I am a chartered civil engineer and I live in Orkney—ignore my accent.

I am the managing director of the European Marine Energy Centre. We are the world's only, and therefore also its first, testing laboratory for full-scale wave and tidal energy devices in the open ocean. We are grid connected and accredited as a laboratory.

We were set up with public sector finance. We have been successful in piloting practically all of the tests for full-scale wave and tidal energy devices in the UK so far. I will be glad to provide more information as the meeting progresses.

Dr Stephen Wyatt (Offshore Renewable Energy Catapult): Good morning. I am the commercial and strategy director for the Offshore Renewable Energy Catapult. Catapult centres are a network of technology innovation centres set up by the UK Government to help the development and commercialisation of technologies in sectors that are strategically important to the UK. The offshore energy catapult engages with innovators in offshore wind, wave and tidal technologies.

I am an engineer and have been designing and running innovation programmes to support wave and tidal technology development for eight or nine years.

Tim Hurst (Wave Energy Scotland): Good morning. I am the interim director of Wave Energy Scotland, a new organisation set up by Highlands and Islands Enterprise and funded through the Scottish Government.

WES's main objectives are to continue the development of wave technology within Scotland, retain the intellectual property of wave energy companies that have gone into administration, provide a pathway for indigenous Scottish wave developers to take their technology through to commercialisation, and drive the technology development process through a collaborative approach.

Elaine Hanton (Highlands and Islands Enterprise): Good morning. I jointly head the energy team at HIE and over the past four months

have worked exclusively on the establishment of WES alongside Tim Hurst. In the recent past, I led the public sector group in HIE that established the EMEC in Orkney. I have been working on marine energy for about 15 years.

Lindsay Leask (Scottish Renewables): Good morning. I am the senior policy manager for offshore renewables at Scottish Renewables, looking after our offshore wind, wave and tidal policy work. Scottish Renewables is the trade association for companies involved in renewable energy in Scotland. We represent over 300 members and have a very active membership in marine energy.

I am a policy wonk so I will leave the technical questions to our engineers in the corner.

Stuart Bradley (Energy Technologies Institute): Good morning. I am the offshore renewables strategy manager at the Energy Technologies Institute in Loughborough. The ETI is a partnership between industry and Government, and we make targeted investments in specific technology projects. We have invested in marine energy technology projects since 2007 and have recently published insights papers on both tidal and wave energy.

I am a marine engineer and have worked on technology introduction projects for the past 10 years.

The Convener: Thank you all very much for that introduction. It is very helpful in setting the scene and making members aware of where everyone is coming from.

Before we begin questions, I will say two things. First, I am conscious that the topic of marine energy covers both wave and tidal power. The issues may be related but they are distinct. I remind members to distinguish in asking questions whether they are talking about wave, tidal power or both, so that we do not become confused.

Secondly, we have a large panel today and it will clearly not be practical if all six of you try to answer every single question that is asked. I ask members perhaps to direct their questions initially at one panel member and, if other panel members would like to comment and to either agree or disagree with something that somebody else has said, I ask them to catch my eye and I will do my best to bring them in as time allows. We have about 90 minutes for the evidence session. If questions and responses can be as short and to the point as possible, that will allow us to get through the topics in the time available.

I will start off and address my question first to Tim Hurst from Wave Energy Scotland, although I will be interested to get views from others. For the past 30 years, we have been talking about wave energy. There have been prototypes, we have had the technology in some form for 30 years and we have been saying that the technology is 30 years away, and yet we do not seem to be making much progress. In a nutshell, why have we not got there quicker? What has been the reason for the delay?

Tim Hurst: There are several issues. The most fundamental one is that wave energy technology is a bigger challenge than we thought that it was—it is huge. We have to create a device that is not only sensitive enough to capture energy from the waves but is survivable in peak waves. That is quite a challenge.

One of the more recent problems is that we have tried to stimulate the development of technology in wave by trying to push technology forward. By our own admission, in the public sector we have encouraged people to move towards full-scale devices and arrays and we have put funding packages in place to do that. That has resulted in us trying to push technology too far and to put things in the sea before they have been fully tested. The end result is that we have failed at the full scale.

Wave Energy Scotland has been established so that we can come back from that, go back to the early stages of the technology development process and go through the process in a more scientific and rigorous way, building up reliable sub-systems as we go and going through a process of verification and certification so that, when we get to the point at which we turn up at Neil Kermode's door with a device that is ready to test, we have done the necessary engineering preparation to give us a good chance of success. There is a combination of reasons why we have gone the way we have, but the approach has not worked and we need to think again about how we do it.

The Convener: Thank you very much for your response. Does anybody want to add anything?

Neil Kermode: I will challenge the 30-year premise, if I may. To be brutally honest, we have only really been trying this for the past 15 years. A lot of innovative work was done by Stephen Salter, in particular, who coined wave energy and put those two words together for the first time. Unfortunately, the programme that was set up, which was quite a big initiative, was killed off by a loss of faith some years ago, principally by the Westminster Government, so it all went into a bit of a hole.

It was only around about the millennium that further work was done, because HIE in particular saw the opportunity that existed, and there was a resurgence in interest and effort. That gave rise to support for a number of companies locally and the creation of EMEC.

A dramatic escalation of effort has taken place in the past few years. I would argue that it was driven entirely by the fact that EMEC is in existence. We have nucleated a lot of the activity so that it takes place around Orkney. I would argue that the issuing of the Pentland Firth and Orkney waters leasing round was entirely due to the fact that we had everybody's attention and we knew that marine energy was possible.

My contention is that we have not really been at the work for 30 years. We have been trying pretty hard lately, but we need to try harder and we need to try a slightly different approach.

Lindsay Leask: I also want to highlight our achievements; it has not all been failures and disasters. We have made some significant progress over the past few years.

I will pick up on the other point that Tim Hurst made about the way that development was stimulated. He said that public sector funding was pushing towards array development when we should maybe have been a few steps previous to that. A lot of private sector investment was looking for the same speed of development, so the whole package was pushing us towards array development for wave more quickly than we needed to be going.

The Convener: On that last point about money, can anyone tell me how much money has been spent cumulatively on trying to develop wave power over the past 15 years?

Lindsay Leask: I might do better to pass that question to public sector colleagues. We have done some research and we have figures for what has been invested by our companies, and RenewableUK, our sister organisation, has figures for what has been invested at a UK level.

Our research shows that our member companies that responded to the survey had invested over £200 million in Scotland. Their supply chain was around 62 per cent Scottish.

The Convener: Is that just in wave power?

Lindsay Leask: Sorry, that is in both.

10:15

The Convener: Do you know what the figure is for wave power? I am keen that we understand the two separately.

Lindsay Leask: I do not have a split for wave and tidal. Overall, the RenewableUK research has shown that every £1 of public sector investment stimulated about £7 of private sector investment. The public sector money has been really successful in stimulating private sector investment.

It would be better if my public sector colleagues answered on overall public sector spend on wave technology.

Dr Wyatt: It is clear that there is a direct correlation between the public sector funding schemes that already exist and the rate of progression of technology development. In my experience, 25 to 30 per cent of public sector money is typically put in to develop prototype technologies and the rest is private sector money. It is very clear that the public sector stimulus leads to activity either in the wave tank or at EMEC.

The Convener: Can anyone answer my question about how much money has been spent publicly or privately? According to our research, nearly £51 million of public money has been committed or spent in developing the sector since 2010.

Dr Wyatt: That number feels about right, if wave and tidal are both included.

The Convener: The figure includes both.

Dr Wyatt: It is also important to look at the level of support that has gone into tidal projects as opposed to technology development. There is a distinction between trying to develop the technology to get a proven product and building the first projects to generate electricity. Tidal technology is at the project stage; wave technology is still at the technology development stage.

The Convener: I am trying to understand when we are likely to see a return on the public money that has gone in. A figure of £300 million is quoted—Stephen Wyatt, I think that it is from your organisation—as what is estimated to be required to take us to commercial readiness. That seems quite a chunk of public money. I presume that there would also have to be private money to back it up. How do you arrive at £300 million?

Dr Wyatt: We did a bottom-up calculation to get that figure. The £300 million is split, with broadly £200 million for wave and £100 million for tidal technology. It is what is needed to get wave and tidal technology to the point we are now at with offshore wind technology, where there is large-scale deployment that can make a significant contribution to the energy mix.

The sum includes the amount required for building the first projects as well as for the technology development. We have typically broken it down into those two phases.

The Convener: How do we know that, if we give you £300 million of public money, you will not come back in five years' time to knock on our door and ask for more, saying that you have not got very far and all the money has gone?

Dr Wyatt: There is an element of risk to developing all emerging technologies, particularly a new form of energy generation technology. In the general scheme of things, £300 million is actually quite small scale compared to the cost of some of the other energy options we could be creating.

What £300 million would do is create an appropriate platform and a long-term signal about the significant funds and political weight behind the technology and project development agendas for wave and tidal technologies.

The Convener: Neil Kermode—sorry, Elaine Hanton, you wanted to come in.

Elaine Hanton: The number you quoted—£51 million—would be about right for the technology development, but let us remember that on top of that there has been public sector investment in EMEC itself of around £36 million. I am sorry that I do not have the numbers at my fingertips; I can check them and come back to the committee with a fuller answer.

The Convener: Neil, did you want to come in?

Neil Kermode: I have forgotten what I was going to say. I will not make it up. That would be a complete waste of your time.

The Convener: Stuart, do you want to come in?

Stuart Bradley: I have some numbers on investment by the ETI. We have committed £34.2 million for marine energy and we have spent £28.5 million to date. Of that, £6.2 million has been on wave technology.

Neil Kermode: I have remembered what I was going to say.

Forgive me, convener, but I am struggling slightly with that number you gave—£51 million—because I am wondering how much of that is spent and how much is committed. One issue that we have had is that money has been announced but has then had to be handed back at a later date as a result of programme failures. That has certainly been the case with some of the Westminster programmes, and the numbers are quite large. The marine renewables deployment fund was £42 million and I do not think that any of it was spent. We need to be very careful about the difference between money being announced and money being spent. I am cautious on that point.

The Convener: A couple of members want to follow that up. We will start with Dennis Robertson.

Dennis Robertson (Aberdeenshire West) (SNP): Good morning. I return to Stephen Wyatt's point about £300 million not being a particularly large investment compared with the investment in other types of technology. Will you expand on that so that we can understand why you think that it is a small amount? Which other sources is it being compared with?

Dr Wyatt: We are talking about two different sectors—wave and tidal—and we should be cautious about lumping them together.

Dennis Robertson: I am happy for you to separate the figures.

Dr Wyatt: The £300 million is made up of public and private sector money. We asked ourselves how much money we needed to reach the point where we could confidently build out wave or tidal farms. A smart Government will, of course, leverage in as much private sector money as possible during that journey. We would typically expect half of the money to come from the private sector for early projects. No one is calling for the full £300 million from public sector funds.

We must remind ourselves of what we are trying to do, which is to create a new form of energy generation technology. In that context, £300 million is a fairly small sum. The ready reckoner that I use is to look at the cost of building a new nuclear power station or something like that. We are talking about gigawatts from tidal and potentially also from wave technology—it is the same order of magnitude. If we look at the costs, we see that £300 million is comparatively not a huge amount.

Dennis Robertson: Given the scenario that you have outlined, why do you think that there has been reluctance to make that investment? Maybe I should ask first whether there has been reluctance about making that investment.

Dr Wyatt: There has always been a challenge around financing the sector, and in the early days—the past five to eight years—we perhaps asked too much of the private sector. We tried to get commercial too quickly. Many people invested on the promise of returns at too early a date. That, in turn, has driven a pace of development that has taken too much risk, and people have been too disappointed when we have had technical failures.

Setting out a clear runway, significant funding behind it and a long-term commitment will allow a sensible pace of development to take place with a proportionate level of technology risk. It will also mean that private firms are not constantly disappointed and exiting the sector, which leads to a stop-start cycle in which teams are built and then laid off and technology is left rusting on the quayside. Long-term, solid commitment from both the private and public sectors will allow us to develop the technology sensibly.

Dennis Robertson: That is interesting. Do any other witnesses wish to comment on the relativity of spending?

Neil Kermode: May I put some context around Stephen Wyatt's point? Work that the Carbon Trust did some time ago found that 20 per cent of the UK's electricity could be delivered from wave and tidal technologies, and the vast majority of that from Scottish waters. That proportion is comparable to the contribution of nuclear energy in the UK at the moment—that is the scale of the prize for wave and tidal technologies.

The Hinkley Point C nuclear power station alone will cost £16 billion. The contract for the outfall pipe for the Hinkley power station, which has just been won by Costain, is itself worth £230 million. The sum that we are talking about is small in relation to the major industrial generation quantities that we will have to reach one day.

Dennis Robertson: We are looking at the development of sustainable new technologies that will not have benefits for just one part of the British islands but ensure the sustainability of energy for all parts of them. Is it your assessment that that is possible if we invest the appropriate amount of money in the new technologies?

Neil Kermode: Yes, because the resource is here. It works on several levels. First, there is the resource in Scottish waters to be harvested, and secondly there is the technology to be developed and deployed. We must remember that the technology is not only the machines but the entire process by which one installs this stuff, so it includes the vessels, the knowledge around the learning and the cabling—all those things work together. To be frank, that gives us a product that will be saleable around the world in due course. If we get this right, we will have a product that we can take around the world.

We are already working with a number of people all over the world who are coming to Scotland to see how to build test centres. We believe that there is a massive market and that, if we get this right, we will be able to sell this product around the world to everybody who has a west-facing coast and an electricity demand.

Dennis Robertson: I am sure that other members would like to come in, but I have a final question. Do you have a timescale?

Neil Kermode: It depends on how much we want this.

Dennis Robertson: I mean regardless of how much we want it. Are you saying that it depends on the investment?

Neil Kermode: The timescale is a function of investment, and there is also a technical pace, because the materials and machines are big and complex and we have to work out how to make them work well. However, there are places where the technology is applicable now. Some interesting niches are opening up, for example around the powering of small sites such as fish farms and in remote locations or island communities. We have started in one location where we aim to supply grid-quality electricity on the first day out. That is quite a big, brave ask and it has not come off quite as well as we would have liked, but there are other spaces.

I think that, within three, four or five years, we will see technical deployments of machines that will be doing useful work. They will not all be economic and cost-competitive with grid electricity at the start, but they will be in some locations.

The Convener: Three members have follow-up questions. We will start with Lewis Macdonald.

Lewis Macdonald (North East Scotland) (Lab): I am interested in a number of the answers that we have heard. I will focus in the first instance on wave power. Tim Hurst said that it has proved to be a bigger challenge than we thought it would be, and Stephen Wyatt said that, in the past five to eight years, we have asked too much of the private sector and tried to commercialise too quickly.

Given that, as Neil Kermode said, work on development has been under way since the millennium, before we look at how we go forward, can you help us to understand why the wrong strategic direction was taken and why we tried to commercialise too hard or too fast over that period? It seemed to me, at least at first, to be developing at an appropriate pace. What has gone wrong to require a re-examination of the way forward for wave, and why?

Dr Wyatt: I will kick off and then colleagues can come in. First, there is always a driver for the public sector to try to leverage in as much money as possible from the private sector to get value for money for the taxpayer. When the private sector says that it can do something, the public sector will clearly let it try and let it invest.

In the earlier days—say, five years ago—wave companies were floating on the alternative investment market. They had venture capital investment and so on, so they had to make substantive claims about their technology, and some of the early indications when devices were in the water off the coasts of Portugal and Scotland gave everyone confidence. We did not expect that we would have to fail a few times before we were successful. We ended up in a cycle whereby private sector money came in, we would spend it and we would struggle to raise more. That has caused us, certainly from a commercial point of view, not to have an ideal pathway to develop the technology.

10:30

Elaine Hanton: When we set out on the process of setting up EMEC as a test centre, we knew that there would be failures and challenges along the way. In a way, the fact that some technologies have not come through and have not delivered as might have been hoped is not a surprise. That has to happen in the technology development space.

EMEC was set up so that failures could take place in a safe environment, if you like. That is what EMEC has provided to the industry, and it has allowed independent testing, verification and accreditation among a support network so that lessons can be learned. Our challenge now is to ensure that we capture as many of those lessons as we can, learn from them and do not replicate them.

Tim Hurst: I agree with Elaine Hanton's comments. We have seen some quite high-profile failures, but the process has not been a complete failure, because a lot of learning and technology from previous programmes can be taken forward. WES is doing some work to capture knowledge from previous wave programmes and take advantage of some of the money that has been invested by trying to take the sub-systems or the experience of operating machines through into a WES programme as part of a more collaborative process, so that we can harvest some of the knowledge.

It is not all about failure. Although there was a high-profile failure at the system level, a lot of good learning has gone on at the sub-system level and we do not want to drop that ball now.

Neil Kermode: I will clarify the point about failure. We have to be clear that we have not failed to prove that the technology works; we have just failed so far to make it commercial. We have not killed or injured anybody. Development work has been done safely and we have not had pollution incidents. It has been done in a cautious, careful and measured way. Problems have generally been at a component level: something has let a machine down.

As has been mentioned, the failure has been that we have pushed people towards going too big too quickly. We have to realise that most of the people who have machines in the water are probably only on their second generation of machine. I think that OpenHydro has had seven turbines in the water, Pelamis Wave Power built six machines in total, TGL has built two and Aquamarine Power has built two. It is very early days in the development process. Generally speaking, the more often we do something, the better we get at it. People have had the chance to have only a couple of goes. It is not surprising that it has not worked perfectly, because the sea is very unforgiving.

I would argue that the single biggest driver that pushed us towards an increase in scale was the means by which we rewarded success, which was through the electricity marketing process. In other words, people could get renewables obligation certificates and they were paid a premium tariff for the electricity that they landed, which meant that they sought to maximise the amount of electricity that they would create from the first machines rather than maximising the learning from them. That is probably the single biggest failure.

We needed a mechanism to reward people for success in doing what we wanted them to do—that clever thing of turning seawater into electricity. Unfortunately, the only mechanism that we had to hand was to charge for it in consumers' bills through electricity tariffs. That led us into a bit of a dangerous space.

Lewis Macdonald: I share the optimism on the potential of the technology, but my question is more about the business model. We have heard about the recent difficulties with that. The important thing for us to understand is what guarantee there is that the same business model failures will not occur again. In other words, if there was undue optimism or ambition among some commercial developers and we had the wrong reward mechanism for Government support, how will those two factors be different going forward to give us certainty and allow the technology to develop?

Tim Hurst: That is an important question. One thing that has happened with public funding in the past is that we have run a programme for a while and there has then been a gap before a slightly different programme has been introduced. Developers have had to change tack and change what they are doing to get funding. They have perhaps had to jump forward or in a different direction to get funding, which has disrupted the technology development process.

That is one of the things that we are seeking to address in WES. We are producing a technology programme that has continuity of funding from the early stage concepts right through to arrival at EMEC. Provided that technologies can meet their technical milestones, they can continue to be funded at an appropriate level to allow them to pass through the programme and get to the point at which they can commercialise.

Continuity of funding is one of the biggest issues that has been raised when we have spoken to the sector about the problems. Our current programme aims to address that directly by providing the technology pathway right through from concept to pre-commercial devices.

Dr Wyatt: We are all aware of the high-profile failure of companies such as Pelamis, but the positive flip-side of that might be that we are no longer held to private sector investment time horizons, which means that we can pause for breath a little and take a longer-term view. Tim Hurst outlined what Wave Energy Scotland is doing, and the long-term commitment that it makes is great.

The other challenge is to ensure that we pull on absolutely every lever that we have from the technology learning that we have had and the expertise that exists, to draw in to that programme and the programmes of other wave developers. That is part of the reason why the catapult has been set up. It is a centre of deep technical expertise in Glasgow to support offshore renewables in Scotland and the wider UK. We need to ensure that we use every tool in the box over the next four to five years to get to where we need to be.

Lindsay Leask: On the actions that we propose to overcome the challenges, I draw the committee's attention to the marine energy programme board report, which we recently prepared with the industry. The board is the UK Government's industry liaison group. We did a bit of work that set out seven key actions that we think need to happen. Three of them cover wave and tidal, and there are separate ones for tidal and a separate one for wave. The innovation part is captured in those actions that we need to take, but we have heard about that, so I will not repeat it. The first overarching action that we think is important is the development of a UK-wide strategy that sets the scene for the development of the sector in the next few years.

BVG Associates did a bit of work for us to look at supply chain gaps. It carried out a series of interviews with companies that are already involved in the wave and tidal sector, companies that were involved but have fallen out and those that are yet to be involved. They were asked about the biggest thing that holds them back, why they are not getting involved in the sector or what made them leave. The single biggest factor was market conditions and market support. Companies are looking for long-term clarity on Government support for the sector. The overarching strategy is the sort of thing that tackles those issues.

The other things that are in the report are on exactly the issues that Neil Kermode highlighted. We think that there could be amendments to the way in which revenue support is driven. It appears that, with the contracts for difference, the product that we have ended up with does not really work for test centres or some smaller arrays. We need to think about doing something that is more akin to a feed-in tariff scheme, which might be more appropriate for smaller developments.

On tidal, we have been looking at performance guarantees. One of the problems with stimulating the big private sector funding is the scale of market that investors look for. Some investors are not particularly interested in schemes that are for a couple of megawatts—they want the tens of megawatts schemes, but we cannot get to the tens of megawatts until we have proved the smaller schemes. Because the smaller schemes have such high up-front capital costs, they are not attractive to those types of investors.

We need to look at ways to overcome that hurdle. We are looking at things such as performance guarantees or availability guarantees for turbines or wave devices. The detail of those is being worked out as we speak and we are still working on exactly how they will work in practice, but they are the kind of things that we are thinking about doing to deal with those real stumbling blocks.

Patrick Harvie (Glasgow) (Green): Neil Kermode said that the sea is an unforgiving environment, and so are markets, as most of the witnesses have acknowledged. What impact have fossil fuel prices had on investment in wave and tidal? Do we even know yet what the impact has been?

Dr Wyatt: You are right to highlight that we do not yet know the full effect, as that is still being played out. It is a double-edged sword. There is significant skills capacity in the oil and gas industry that is now available to bring to bear in the offshore renewables sector. We are seeing more availability of vessels and of engineers who have many of the skills and the toolkit that we need to solve many of the challenges that the sector faces. That is the positive bit.

The obvious negative bit is that energy has got a whole lot cheaper. In the short term, we have that counterfactual in the measure of what we are competing against. However, we all know that fossil fuels are finite, and over the longer time horizon I do not think that prices are going to be a significant issue. The blip could shake investor confidence but, equally, the large redundancies and zero-hours contracts that we are seeing in the oil and gas industry are a strong message that we need something a bit more stable in the longer term.

Patrick Harvie: The argument about stability is important. Several witnesses have talked about the difficulty for the long-term development of a new industry that is caused by its running according to short-term private sector timescales. There is an argument for a long-term or even—

can I suggest?—permanent public sector role in the industry.

If the public sector is necessary to help to bring the industry to fruition, should it be seen simply as helping the industry along to the point at which the private sector can take control again and all the profit flows into the private sector, or should it be looking at ensuring a public sector return on the necessary public sector investment? Should we be looking at a permanent public sector role rather than simply a transitional one, given the necessity of that long-term stability in the early stages?

Dr Wyatt: Perpetuity is obviously a long time. We are all in the game to try to develop a commercially viable industry for the wave sector and indeed the tidal sector, but we acknowledge that it is a long game. We are talking about five or 10 years—

Patrick Harvie: Or perhaps longer.

Dr Wyatt: —before we can begin to get proper commercial returns in a subsidised environment, and after that the question will be what level of subsidy the industry needs.

Patrick Harvie: Does anyone else want to comment?

Neil Kermode: We can break down the industry into a couple of components. Some pieces certainly could benefit from enduring support. The main one that comes to mind is the way in which the grid operates. We know that there is not grid to the places where the marine resources exist and that we have to get grid to those places if we are going to make the most of the resources. As the resources will be enduring, one would imagine that the value that we can obtain from them will also endure, so it would seem entirely appropriate for the public sector to take a significant role in leading the development of such pieces.

I also argue—I promise you that this is not self-interest—that we need to recognise that test assets are difficult and complex and have changing needs as the industry grows. I point out that the motor industry has a number of test centres around the world for its cars, and we invented those over 100 years ago. A technical journey inevitably needs to be embarked on, and if we want to make sure that the real value flows back to Scotland, it has to be through the IP that is created around the technology rather than purely through the value of the electrons that we land.

There is an awful lot to be done in that space, and I would absolutely argue that there is a strong opportunity for enduring public sector involvement.

Elaine Hanton: There is also an on-going public sector role in the supply chain development and supply chain engagement in the sector. Retaining the IP and the knowledge within Scotland is one thing, but we also want to ensure that as much as possible of the manufacturing and wider supply chain activity that is associated with developing and supporting the sector is kept here. There is also an on-going role for Scottish Enterprise and HIE, as Wave Energy Scotland starts to operate, to ensure that projects that are attracted to Scotland spend in Scotland and base themselves here.

Patrick Harvie: I wanted to ask about IP as well, convener; shall I deal with it now, as it has come up?

The Convener: Yes.

10:45

Patrick Harvie: My question is particularly for Tim Hurst, as it is about the Wave Energy Scotland operating, or business, model. Could you explain in more detail than is in the written submission how the IP will operate in Wave Energy Scotland's model? I understand that a certain amount already has been acquired from Pelamis that resides now with Wave Energy Scotland.

Tim Hurst: Yes.

Patrick Harvie: One hopes and expects that there will be further development of IP in association with other companies. How do you envisage the long-term relationship developing between Wave Energy Scotland and the IP that it manages? How will the revenue flow from that IP, whether it is deployed here in Scotland or by companies that export it round the world?

Tim Hurst: We intend to deal with the IP within the WES programme by funding technology development but allowing the contractors to keep the IP. We will require them to commercialise the IP and sell it within the industry. We will also require them to be willing to license it to others at commercial rates.

Our idea is that, if a contractor comes into the WES programme, it will get the funding and own the IP, but it can keep the IP only if it does something with it—if it supplies its subcomponents or whatever into the market to stimulate growth and push us towards commercial wave devices. There will be a number of clauses in the contracts that we sign that say that if a contractor does not use the IP for a period, it will revert to WES.

Patrick Harvie: Will that happen automatically?

Tim Hurst: Yes. If a contractor tries to sell it, we get first refusal on buying it. In particular, if a contractor does not share the IP within the programme—for instance, if a subsystem supplier decides to have an exclusive arrangement with a particular wave developer—we would claw back

the IP. The aim is to give the IP to the contractor and to get it to use the IP by commercialising it and making that technology available to all within the programme.

Patrick Harvie: I am interested in the point that you make about the first right of refusal to acquire IP that has arisen through Wave Energy Scotland's investment. What will the attitude be to the exercise of that right? Will Wave Energy Scotland proactively seek to acquire IP in those circumstances in order to gain additional benefit in the future, such as through licensing it to others, or will it simply operate as a transitional owner so that the IP goes back into another private company?

Tim Hurst: We would buy it only in exceptional circumstances. Our view is that we do not want to own IP. We think that IP is best kept in the private sector.

Patrick Harvie: Why?

Tim Hurst: There are a number of reasons. We can look back at other models of public sector ownership of IP, such as ITI Energy. There have been a number of attempts to own and commercialise IP, and it has never been very successful.

The management of all that IP is a huge workload in itself. We are planning to have around 50 projects running at any one time in Wave Energy Scotland, and that would be a huge volume of IP to manage. I cannot see an advantage in doing that, apart from the potential commercial advantage of us licensing that IP.

Patrick Harvie: If you cannot see an advantage in owning it, why would the private sector see an advantage in owning it?

Tim Hurst: It can commercialise it and sell it.

Patrick Harvie: Surely the public sector can license it and see the technology deployed, with the private sector rather than the public sector being the operator. Then there would be some return on the public investment.

Tim Hurst: There is also the consideration of creating an environment that is attractive for industry to come into. If companies do not believe that they can retain the IP, they are very unlikely to join the WES programme.

We have done testing with a number of companies, particularly with the larger original equipment manufacturers, which are the ones that we are trying to bring into the sector. In one of our models it was suggested that we would own the IP and license it back to the companies, and there was a reluctance to get involved.

We have to be honest about where we are with wave power. It is a sector that not many people in the industry want to get involved with, because they do not see it as a huge market. We have to create a programme that is attractive to them, to bring them in and to get them to bring their knowledge and technology to develop wave technology. If we create an environment that has IP arrangements that they do not like, that will discourage them from joining the programme—that is not just my view; I have tested that with a number of organisations.

Elaine Hanton: It may be fair to say that that was the experience with ITI. Many months were lost in trying to negotiate IP arrangements with applicants to ITI, and many projects were not taken forward as a result of that. We hope that we have the safeguards in place to ensure that, if the private sector, in working with WES, does not behave in the way that we wish it to, WES will be able to step in and enforce that. By the same token, we are trying to make it attractive enough so that the private sector will want to participate in the first place. We are also trying to take people in from other sectors, as well. We have to strike a balance between making it attractive, so that people will want to participate, and having safeguards in place to ensure that we retain the benefit in Scotland. We hope that we have got that balance.

Patrick Harvie: There seems to be an odd contrast between the argument that we cannot rely on the market or the private sector for consistency in long-term investment—not just in current scenarios but, given the unpredictable volatility of oil prices, for as long as they remain a crucial signal for investment—so we need long-term reliance on public sector investment, and the argument that public sector investment should get the lowest return.

Elaine Hanton: The safeguard is in place that there will be a free licence back to WES from any IP that is created through WES. If the private sector player does not fulfil its part of the deal to commercialise and develop the technology, WES will have the ability and the right to sub-license that technology to anybody else in the market. That safeguard will ensure that the private sector operators develop technology as we expect them to under the contractual arrangement that we will have.

As I say, there is a balance to be struck. What do we need to do to ensure that we get the right people in the programme and not just those who have nowhere else to go? We want people who have skills and experience from other sectors that they can bring to bear to help us to develop the technology. That is why we have gone down the route that we have gone down.

Dr Wyatt: I partially agree with WES on the topic. I have spent a lot of time working on

innovation programmes for wave and tidal, and it comes down to unique selling points. I do not think that it is necessary for all technology developers to own all the IP all the time. All too often, IP becomes the barrier to collaboration. It is necessary to look quite hard at which bits of the IP need to be in the private sector to enable a key stakeholder or engineering company to develop commercial revenues further down the line and which bits are not so important to that journey. We need to be fairly precise about where we want to create collaboration by releasing some of the shackles around IP and which areas we recognise as being core technology that will, at some point, need to be commercialised and will require an arrangement to allow the private sector company to get commercial revenues from it.

If we asked the private sector whether it would prefer to hang on to its IP, it would say yes. However, that sometimes becomes a bit of a bind, because everyone thinks that everything is valuable. In working with other technology-literate partners, WES needs to identify which are the important bits—the bits that really matter—and how they are to be handled.

Patrick Harvie: The answer to my final question may be a simple yes or—more in line with my expectation—no. If Scotland has a long-term interest in seeing the whole industry prosper and develop, is there any role at all for open licensing of intellectual property in the industry?

Elaine Hanton: Possibly. What we have set out to date is the route that we have taken for the first call under the WES initiative. We will see how that goes and whether it works. If it is not working and there appears to be a better arrangement, we will evolve the process and look at better ways of doing it. We want to make sure that we learn lessons not just from the past but as we go and that we are flexible in our approach to how WES operates. If we need to change arrangements, we will do that. The ultimate goal is to develop technology and, if we are putting barriers to that in place, we will not meet our objectives.

Patrick Harvie: Could aggressive protection of IP be a barrier?

Elaine Hanton: We think so.

Neil Kermode: The parallel that keeps coming back to my mind is what happened with the chap—whose name I cannot remember—who invented the shipping container. He cracked the whole thing—he worked out the size of them, the way the doors should shut, the way they lock on the corners and the whole design. He protected the whole lot and made it freely available. In doing so, he made sure that everybody used exactly the same kit, because they did not have to invent a way round protection of IP. There was standardisation, which allowed the whole process of shipping boxes to take off.

There may be spots where we can identify a blocking step. Having public ownership and providing a free licence might be unblocking elements, so I can see some role for that.

Chic Brodie (South Scotland) (SNP): I have some sympathy with the view that Patrick Harvie expresses. Scottish water is a natural resource, although there has to be recognition of the need for a return on the investment in technology. The Northern Ireland Government had a very interesting collaborative project, the Tellus Border project, to develop mineral resources.

We have talked about wave energy, where it sits in the hierarchy of energy provision and, as a consequence, where investment might flow. We have talked about fossil fuels and the predictions on oil prices, such as Brent crude. There are predictions of the oil price being $120 to $140 a barrel, which makes the sector attractive and sucks in investment.

What comparisons have been made between wave and tidal, first through technical due diligence and secondly through commercial due diligence? We have had the global numbers, but who sits down and looks at the overall impact of investment and the rate of return that is anticipated by the private sector investors?

Dr Wyatt: From a Government perspective, at UK level, there is the technology innovation needs assessment—TINA—framework, which looks biannually at all the possible forms of renewable energy generation, the barriers to commercialisation, the economics around that and the associated gross value added to the UK. That framework, which is freely available, allows Government to compare across all the renewable energy technologies and consider where to make innovation investment. Clearly, one of the facets of that is the timeline. Where would we like to invest now for energy generation in the next few years? Where do we want to be in 10 to 15 years? I would point to the TINA framework as a sensible comparator to look across the piece.

Tim Hurst: I agree with Steve Wyatt. That is the main source of that information.

Chic Brodie: The reason for asking is that I have had some dialogue with a company in Johnstone that manufactures submersibles. It has its own tank for testing. We have had conversations with Marine Scotland, which has had a PhD in accountancy look at the numbers along with the technicians. It now wants to do beta tests—the project is well down the road, I hope.

With public investment, however, I am not sure who is considering where we want to invest and

where we will get the earliest rate of return. I am not sure how we address that.

Dr Wyatt: The TINA analysis is definitely a good source for that type of data. The benefits of the technologies are sometimes felt in fairly small pockets. The benefit from marine energy is felt right here in Scotland—it is in Orkney.

We can look at the UK-wide numbers, or the European or global numbers, but it is also important to look at where the benefit is concentrated. Going forward to 2050, we are going to have a balance of energy technologies providing our energy mix. Using a broad-brush comparator is sometimes a bit challenging, because certain areas are more appropriate for certain technologies and their benefits.

11:00

Chic Brodie: I have one last question. In terms of the broad brush, surely someone—some group or the Government—has done the technical due diligence on what is going to get to the market first?

Dr Wyatt: Yes.

Chic Brodie: I do not believe that there has been a failure. As Neil Kermode indicated, any new project, product or service will hit the occasional bump. Looking at the public investment in the sector, I would ask where we are going to get the earliest return and how we can optimise the opportunity for Scotland to drive the market. Where does that opportunity lie between wave and tidal?

Dr Wyatt: Certainly from a technology perspective, we have a good grasp of where the economics are right now and where they might be in the future. The Offshore Renewable Energy Catapult is there to consider what innovation building blocks are needed to get us down the cost curve and what deployment rates will bring that learning that we see in other sectors. What does the shape of that curve look like? We are able to do that for wave, tidal and offshore wind and there are other data for other renewable technologies in more conventional plants. That comparison can be done.

We are still in the proving phases of wave energy technology, so we need to know whether we can come down the cost curve in the longer term. Right now, our focus is on whether we can make the technology work reliably.

Gordon MacDonald (Edinburgh Pentlands) (SNP): I want to ask about some of the challenges facing the sector. The submission from Scottish Renewables says:

"uncertainties around longer term market visibility ... has impacted investor confidence".

The recent announcement by National Grid and Statnett is that the interconnector from Norway is now going to come ashore at Northampton. I understood that it was originally going to come ashore in the north-east of Scotland, which would have allowed the wave and tidal power to be sold on the European energy grid once it was complete. What impact will that decision have on your sector in terms of one-market availability?

Lindsay Leask: Forgive me, but I am not an expert on the Norway interconnector and the direct impact that that decision will have had. As a whole, for the wave and tidal energy sector, grid is a long-running issue. It has always been one of our main asks. No doubt you will have had witnesses giving you evidence on grid charging and needs assessments. It is still a challenge.

Scottish Renewables did not agree with everything that came out of the project transmit process, but some of the changes were definitely beneficial for renewable energy developers, including those in relation to the changing locational charging regimes. It is disappointing to see that the implementation of those changes is still held up in legal processes.

We were pleased to see the Office of Gas and Electricity Markets—Ofgem—consulting on ways that it can amend anticipatory investment, which means making it easier to make a needs case for anticipatory investment for the distribution network. In the case of Orkney there is a specific issue, which is that some of the incremental changes may undermine the broader need for that sort of holistic change to the system; if we are constantly tinkering at the edges with the distribution work to make it fit for purpose in the short term, that undermines the need for a greater change to transmission system. I am sure that Neil Kermode has a lot to say about that.

I could not tell you what specific impact the decision about the interconnector has had on wave and tidal power, but getting clarity and understanding in the grid connection and charging regimes is incredibly important.

Gordon MacDonald: I was going to move on to the grid connection charges, but does anyone have a view on the interconnector?

Neil Kermode: Fundamentally, the fact that it has a more southern landfall is less helpful than it would have been if it had been nearer to us, because we have further to go to get to it.

We need to think about the grid as working in two directions. It is not just that it is a means for us to send energy out; it is also a means for us to bring energy in and balance the system. There will be times when there are no waves but there is plenty of Norwegian hydro. Getting the cable connector nearer to us was important and would

have been useful. However, it is not the only game in town and the scale of the connectivity that is going to be needed will dwarf that connector on its own.

To give you some context, a case in point is Orkney, which has connectors that allow it to support the 30MW or so of demand that the islands represent. The generating capacity of the islands with wave and tidal—and offshore wind, which is also big—is probably in the region of 4,000 or 5,000MW, so there will have to be further cables to those islands and then we will need to patch in Shetland.

It would have been useful if the connector had been nearer to us, but it is not the end of the world, as it is only the first game. There will be more strands in this tapestry.

Gordon MacDonald: Would the €2.1 billion that is being underwritten by UK taxpayers for the project have been better invested in making connections in the north of Scotland to the islands and so on?

Neil Kermode: Yes—not to beat about the bush. I do not know the quality of the investment decision that was taken so I do not want to compare one with the other, but we certainly need to make sure that we are looking at making investments in those areas because, quite clearly, the resource is there and it will not work without the wire.

Elaine Hanton: To have the Government underwriting support for island cables would go a long way to appease some of the concerns and would do a lot to support the green sector as it grows on our islands.

Gordon MacDonald: You guys have to sell your electricity once you get the technology right, and we are in a situation in Scotland in which transmission charges are substantially higher than elsewhere in the UK, where subsidies apply. Also, connection charges are more than double those in the south of the country and you have a new interconnector coming in that, as I understand it, does not attract transmission charges. Is that really helpful for the renewables industry in the north of Scotland? Are the Governments—especially the UK Government—doing enough to tackle the issue and put things on a more level playing field?

Neil Kermode: As I am the only witness who is not part of Government, I can stick out my neck on this one. The Government clearly needs to recognise the scale of the opportunity. We have been arguing long and hard with Ofgem and others who have come up to see us that we are failing to grasp the opportunity and that the grid is fundamentally holding us back.

I have a slight contention with Lindsay Leask's point about project transmit. Project transmit worked well within mainland Scotland, but it did not get as far as the islands. It does not help the islands at all.

Mr MacDonald is quite right about the interconnector. If we had an interconnector from Orkney to Norway, we would not pay transmission charges. If we have one that goes south, we do pay charges.

Lindsay Leask: I just want to clarify that I am also not part of Government, before there is any confusion.

I completely agree with Neil Kermode—that was the caveat about project transmit. There was a lot that worked for some of our members in relation to some of the technologies, but there are other bits of the project that just do not work. We appreciate that it was a very long process that went on for lots of years with lots of input. We welcomed some of the changes and they were good to see, and it is frustrating that their delivery is still being held up, but we are by no means suggesting that the outcome of project transmit was perfect.

Dr Wyatt: It perhaps sounds obvious, but there is a risk that people look at this industry and say, "They won't need the grid until 2020—that is when the real electricity is going to happen." Actually, we need the confidence that we can sell electricity and there is a back-up effect that people will not invest in the technology now if they do not have the certainty that they can export electricity when they make it.

The Convener: Dennis Robertson has a brief supplementary.

Dennis Robertson: Following on from Gordon MacDonald's point, I wish to refer to figures that many of you have mentioned in the past. There is potential—we use the word "potential"—for 25 per cent of Europe's wave resource and 10 per cent of Europe's tidal stream resource to be based here in Scotland. That is saying that the resource is there. I do not think that those figures are really disputed, but are we saying that, to realise that 25 per cent of wave and 10 per cent of tidal, we need that infrastructure?

The Convener: That looks like a yes from our witnesses.

Lindsay Leask: Just to clarify, I think that it is the other way round. In any case, as Neil Kermode often points out to me, 25 per cent of nothing is nothing.

In Scotland, we are looking at 18GW of theoretical wave power capacity and 11GW of tidal. Of course, no one is suggesting that we are going to be able to exploit all of that—that is just the theoretical potential. I should also point out

that, although the figure is 10 per cent of Europe's wave power, we are actually talking about a bigger resource. Indeed, it is a bigger global resource, given that the market around the world is bigger for wave than it is for tidal.

Elaine Hanton: It is also worth remembering that there is a long lead-in time for grid investment; it can take a number of years. In fact, in order to have the grid ready for 2020, we need to start the work right now. There is no time to delay.

Richard Lyle (Central Scotland) (SNP): Very interesting points have been made this morning. I note Neil Kermode's comment that a new nuclear energy facility would require an investment of £16 billion, but how much would we need to invest over the next few years to move the project that we are discussing along? I know that you have had various setbacks—indeed, as has been made clear, there are setbacks with every new investment—but when do you think we can get where we want to go and how much more money will we need to invest to ensure that we get what we need out of this project?

Neil Kermode: I will hand that question over to Stephen Wyatt, because my job is to focus on the guys who rock up on the beach and try to make this stuff work.

Richard Lyle: So he supplies the money and you make it work.

Neil Kermode: On a good day, yes.

Dr Wyatt: Unfortunately, I do not supply the money. I would love to be able to.

Typically, it costs about £10 million to take a prototype wave device to EMEC for testing and to evaluate an iteration of the technology. The real question, therefore, is how many options the industry needs to create. Do we put all our eggs in one basket and back one technology? I guess that that is what we have done in the past, but we now believe that we need three or four technology options and that we have to keep a number of irons in the fire at this stage. Eventually there might be design convergence, and we might end up with all the wave technologies looking the same. Right now, however, we do not know exactly what that winning formula is going to be, so we have to spend £40 million or £50 million to keep four devices alive and in the water at EMEC.

It is important to point out that we are not necessarily champing at the bit to build more full-scale prototypes tomorrow. What we also need to do is some learning at a reduced scale that costs a whole lot less. Typically, the industry looks at 10th scale, at third or quarter scale and then at full scale; those are the orders of magnitude with regard to funding, and what would cost £10 million at full scale might cost only £1 million or £2 million at, say, third scale and a whole lot less in the wave tank.

It is really a question of balance and ensuring that we are sensibly proving what we can in the wave tank and at quarter scale at the EMEC nursery; we then tentatively go into the water at full scale to shake down the things that we could not have found out in the wave tank or beyond. It is really a question of having a blend of portfolio activity, but to give you a flavour of the cost I repeat that it costs £10 million per device at the full-scale stage and a whole lot cheaper before that.

Richard Lyle: In your submission, Lindsay, you say:

> "there have been significant challenges over the last few months, leading to a reassessment of the scale and pace of development in Scotland over the near term."

What do you mean by that?

Lindsay Leask: I think that the point captures most of the discussion that we have been having this morning. It is all about the understanding that, particularly in the wave sector, the technology has not progressed at the speed that a lot of us originally envisaged, and that that has caused all of us to step back and reassess things, to put in place other schemes, such as WES, to make up for and adapt to that situation, and to think about how quickly we will be able to move to the scale of industry that we all want.

Richard Lyle: So you are saying that we have something with infinite potential on which we could make loads of technological advances that we could sell all over the world and make loads of money on, and that we are still very far away from doing that, but that, when it happens, everything will fall into place. Is that what you are saying, Neil?

11:15

Neil Kermode: Yes. There is a lot of truth in that. I keep coming back to a parallel that somebody gave me a long time ago about the aviation industry. The point—I would argue—is that in wave and tidal but particularly the wave industry we are quite close to where the Wright brothers were when they got heavier-than-air flight working for the first time. At that point people had been trying to aviate for hundreds and hundreds of years, and eventually they got it right.

The fundamental principles that the Wright brothers used in terms of the lift and the controlling processes are in every aircraft that flies today, so they got bits of it right. However, we certainly would not regard the Wright Flyer as a commercial aircraft now. The Wright brothers sold their second and third aircraft, which led to a whole industry

being created. However, there have been energy changes and levels within that that were largely driven by wars and strategic imperatives to get things sorted out.

We can escalate the scale of wave and tidal, but we need to be able to do it when we are technically ready—and the need is here. The need is becoming more pressing given that a few weeks ago we passed the level of 400ppm for carbon dioxide for the first time in human history. Therefore, the pressing need is definitely here but the technology is not quite right yet. As Stephen Wyatt said, the critical thing is to make sure that we innovate and develop at a scale that we can afford, get good at what we can do at that scale and then be ready to blossom when we get it absolutely right.

I would draw a parallel to what happened in the past when we got it badly wrong in Orkney with wind. We had a test centre in Orkney at Burgar Hill, with the most innovative wind turbines around. We went for a jump from a 300kW machine to a 3MW machine but there were some technical issues. It worked and it was fine, but people were not quite comfortable with it. As a result, we gave up our wind industry. The Danes, on the other hand, stayed with it and have had a huge success. Now, turbines have passed the 3MW mark and are heading towards bigger megawatt machines—for example, an 8MW turbine has just gone up.

We stalled on wind and we did so because we pushed a little too hard and too fast at a critical moment. We need to get really good at what we are doing, use the technologies and facilities that we have to make sure that we understand them, and then build up when we are ready. We should not force people to go to the water too early.

Richard Lyle: So basically the message is "Stick with us: we're gonna do it. And if you do stick with us, we'll ensure that we do it."

Neil Kermode: I wrote the word "patience" on the bottom of my pad before I came in today, and that is something that we absolutely need. We need a degree of impatient patience. We need to keep pushing, but we must not be unreasonable, say, "That's it", and walk away.

The creation of WES was a brilliant move. At a time of threat, Scotland stood up and said "We're not having this", and stepped towards the threat. That was exactly the right thing to do. We could have stepped back and said, "No, it's all a bit hard really," but we did not. That is why it is such an innovative process and we need to support it. We have to ride it through because the win is so huge it would be criminal not to.

Lindsay Leask: Taking the convener's tip, I think that we still need to differentiate between wave and tidal. We were talking generically then, and wave is indeed further behind. However, Mr Lyle asked about being so far away and when we look at tidal we have to remember, for example, that we have MeyGen, which has just completed financial close, and that Nova Innovation is doing fantastic things up in Shetland.

We are looking at our first arrays, however small, coming to fruition in the tidal sector. The idea that things are so far away is not true for tidal, but wave is in a different place, as we have all acknowledged this morning.

The Convener: I will take a brief supplementary from Patrick Harvie.

Patrick Harvie: Neil Kermode made a comparison with aviation. You said that the urgency was there for early aviation but that war had been an imperative that spurred the development of the early aviation industry. You talked about the urgency of climate change, which is clearly understood. However, we are not yet seeing anything close to the same imperative from that as war delivered for aviation development. What is needed to turn the scientific recognition of urgency into the political imperative that is necessary to spur the wave and tidal industry in the same way as you outlined happened with aviation? I know that that is not an easy question.

Neil Kermode: The risk is that we say that we have to get wave energy going and do it tomorrow, but there is a desperate rush and we are not prepared. We have to get the technology. I am spending my life doing this, so I fundamentally believe that the technology will deliver benefits when we are ready to go and do it. We can only ever prepare the equipment, get things organised and learn how to optimise it—and therefore do it at the lowest possible cost—in the expectation that there will be deployment. The point was made that setting the market conditions means that people will focus on the technology, continue to drive and develop it and be ready for the opportunity when it opens up.

Can Government trigger that opportunity? It can do so to some extent through demand. It could choose to set a market for wave energy. It could say, "We will buy umpteen gigawatts of wave energy. First one ready, bring it on." A number of things could be done in that space, but there is not one clear picture.

We have seen that the renewables sector works. It generates jobs—250 to 300 people are working in the sector in Orkney. It is real where we are. We know that it can be delivered, but we must have the patience to get the technology right, rather than go off and do it half-cocked.

Patrick Harvie: The timescale for decommissioning generation from fossil fuels might focus the mind.

Neil Kermode: It could well do.

Elaine Hanton: The commitment and political support that we have in Scotland, exemplified by the establishment of Wave Energy Scotland, allow us to do exactly what Neil Kermode has set out. That allows us to take a breath, pause, look at what we have done right and look at the things that clearly are not going to succeed and put them aside. It allows us to take the step-by-step, rigorous engineering approach to developing the components and sub-systems in a competitive way, so that we take forward—we hope—a small number of technologies, which the private sector will step back in to help us commercialise to create generation around the Scottish coastline. That is exactly the approach that we need to take and we are satisfied that the budget that we have available to us is appropriate for the work that we have ahead of us with Wave Energy Scotland and the early-stage prototype and technology development.

The Convener: We have another brief supplementary, from Chic Brodie.

Chic Brodie: The Ernst & Young report showed the UK being downgraded to seventh for renewables sector investment and, by default, particularly new products. I will not ask you where you think Scotland fits in, but is that down to a lack of innovation? Are we too risk averse? Has it been to do with electricity market reform or the lack thereof? We talked about patience and the need to get things right. What is happening elsewhere? What countries are managing to leapfrog the UK on investment in the sector?

Tim Hurst: Investment in wave energy around the world has reduced; that is not happening just in Scotland. When we talk about investment in renewables, wave technology is a separate case. We have certainly seen a significant change—not just a reduction but almost a complete drying up of the investment in wave technology.

In January last year, when the then First Minister had his summit on wave technology to look at the reasons why investment had dried up, it was clear from the industry representatives who turned up that day that it was all about the technology. Their view was, "Get the technology to work and we'll come back to the table and reinvest." That was the strong message across the representatives and that was the big stimulus for setting up Wave Energy Scotland. It is exactly our role to get the technology to work. We should put all our efforts into that, and investment will undoubtedly return.

Lindsay Leask: The specific reason given in the Ernst & Young report was about EMR, so it related to the renewables sector as a whole. It has been a big shift for us to understand the EMR regime coming in and to get our heads around the new contract for difference regime. As Neil Kermode and I have said, that has not had too much of a direct impact on the sector.

Some really technical stuff has been challenging in terms of scale of market, but we have got to a point at which we have realised that the product does not necessarily work for the very early-stage technologies. We need to have something akin to a feed-in tariff for the first small-scale arrays and for the test centres. That is probably more appropriate than trying to play into the CFD regime. I think that that was the underlying reason behind what the Ernst & Young report said.

Chic Brodie: So we know where we are internationally on development of the technology and competitiveness.

Neil Kermode: We absolutely do. A lot of the work that has been going on at EMEC has involved international players coming in and playing here. We continue to attract people who want to come and try their technology. They want to try it in Scotland because they know that there is a market and they can see that the environment is supportive. We are still at the pinnacle of what is going on, even though the pyramid has sunk slightly. People are keen to find a way in. We are in the right place on the international side of things, but it is up to us to make the most of it.

Lindsay Leask: As Steve Wyatt said in his submission—in fact, I think that we all said it in our written evidence—we might still be at the pinnacle, but the rest of the world is catching up rapidly and is nipping at our heels.

Dr Wyatt: It is probably worth saying that the reason why many international technology developers have in the past been visitors to EMEC and the UK more broadly is to do with public sector commitment and the availability of public sector support. Frankly, people come here because they can get support with the costs of developing their technology.

I probably disagree slightly with the suggestion that we are level pegging with what is happening elsewhere. Something that keeps me awake at night is what is happening in the US, where the Department of Energy has a major push on wave energy technologies—it is offering $100 million or so on a competitive basis to develop them. We must be cognisant of other things that are happening.

Tim Hurst: It is important to say that the DOE programme is pretty much in line with the programme that we are about to kick off. It is along the same lines in providing a competitive pathway for technology development.

Elaine Hanton: We most definitely still have a lead in the learning that we have had on the technologies. We have hit the buffers first, but other countries will suffer similar problems. We definitely have a lead in that regard.

The Convener: We are getting close to the end of our time and two more members need to get in.

Joan McAlpine (South Scotland) (SNP): I will go straight back to investment. Perhaps Lindsay Leask might want to tell us how much assistance her organisation's members have had from the Green Investment Bank.

Lindsay Leask: That is an interesting topic. The Green Investment Bank is a hot topic as far as marine energy is concerned. At the moment, it does not invest in marine energy projects, and there is a question about whether it should.

Joan McAlpine: The Green Investment Bank does not invest in marine energy.

Lindsay Leask: Not at the moment.

Joan McAlpine: Even though it is a green investment bank.

Lindsay Leask: The reason is to do with the way in which the bank was set up and the terms on which it must enter into commercial deals. Marine energy is not seen to be ready for the type of investment that the bank is bound by its regulations to make.

However, we are having lots of discussions with the bank about amendments that could be made and how GIB funding could be brought into the sector. The Scottish Government has been fantastic at being flexible and reactive in how it provides support to the sector. It has done that through the marine renewables commercialisation fund. Grant funding support has been made available when it has been needed and changes have been made to the renewable energy investment fund in recognition of the GIB's inability to invest in the sector. The Scottish Government has tried to make up for that.

There is a question about whether the bank could soon start to invest in tidal energy projects. That is part of the discussions that we are having with it.

Wave energy is a different game. We certainly speak to the GIB a lot. It is a very hot topic.

Joan McAlpine: The Green Investment Bank is a UK Government initiative and a great deal was made of the decision to locate it in Scotland. Have you had political engagement with the people who make the decisions at UK Government level about the difficulty that you are having with the GIB?

Lindsay Leask: Yes. We speak about the issue a lot with our UK colleagues and we have taken it to Westminster.

Joan McAlpine: What success have you had there?

Lindsay Leask: We are getting there. There is definitely interest in what we have to offer. The sector has a lot to do to prove that it is at a stage that makes it ready for such investment and to play that kind of game, and that is what we are trying to achieve. We are having a highly constructive discussion with the bank.

Joan McAlpine: When the GIB previously appeared before the committee, it revealed that only 1 per cent of its funds are invested in Scotland. Is that because of the policy regarding marine and tidal energy?

11:30

Lindsay Leask: Not necessarily—I would not see it that way. I do not know how much that percentage would grow if the GIB decided to take on marine energy, in comparison with what would happen if it invested more in offshore wind projects in Scotland, for example, which would involve higher and much more significant investments. I am not sure about the role that that would play in percentage levels. As I said, we are keen to keep following the discussions about the GIB and its relationship with the marine energy sector and specifically with the tidal sector.

Joan McAlpine: I think that a lot of people outwith the bubble would be surprised to hear about the situation, given the hype around the GIB. Would other members of the panel care to comment on that?

Dr Wyatt: The figure that you quoted, which shows how much activity goes on outwith Scotland, is an artefact of the type of projects that have historically been invested in. They have mainly involved offshore wind, and most of the projects that are being built and refinanced are south of the border.

It would be constructive to have pretty clear sight of the conditions and criteria that could trigger an investment from all investors, and particularly from the GIB. That would at least set out what we are shooting for. Organisations such as mine have an opportunity to work with the investment community to help us to better understand the conditions under which those organisations would invest.

Joan McAlpine: Does Neil Kermode have any thoughts on that?

Neil Kermode: I wonder whether elements of what the GIB could do might support the

underlying infrastructure. That might not be appropriate for the GIB, given the technical risk that might exist with some of the projects. However, most of those projects will require a grid behind them, and there might be some mechanism for bringing in such investment.

The same applies to a testing infrastructure. There may well be places in which the GIB might be able to meet its investment criteria—I am not a banker, so I cannot comment on how high it has set its criteria.

Joan McAlpine: I wonder what the point of having the GIB in Scotland is if only 1 per cent of its funds are invested in Scotland. I see Tim Hurst shaking his head.

Tim Hurst: No—I agree entirely.

Joan McAlpine: Neil Kermode made a comparison with Denmark in the 1970s and 1980s, and our Scottish Parliament information centre briefing for today's session refers to that example. Does the sustained investment that happened in Denmark—and in Germany, I think—in the 1970s and 1980s provide a good comparison in terms of the money that those countries spent to get themselves to a place where the technology was commercial and they became world leaders? With the right level of public investment, could we do that for wave and tidal energy in Scotland?

Neil Kermode: I would have thought so but, if someone has better numbers than the ones that I have in my head, they can say so. I recollect that, every year between 1993 and 2003, Denmark put £130 million into wind energy, which amounted to £1.3 billion overall. The Danish gross value added on wind was—

Tim Hurst: It was £1.5 billion.

Neil Kermode: It was £1.5 billion last year—I have seen figures even higher than that—so Denmark got its money back in just a year. That sort of approach makes a lot of sense.

What Denmark also did—I have not seen the UK as a whole do it, although we have done something in Scotland—was positively polarise the population towards such investment. Denmark had wind guilds, which involved a savings scheme that allowed people to invest in their own wind projects. Basically, that was crowd funding. That meant that, when a village saved enough money, it wanted to build a wind turbine, and it also wanted to see how its investment was doing. That led the country to a place where, rather than trying to hide wind turbines, it was proud of what it was doing.

There is an emotional element that we need to make the most of. The UK sees itself as a maritime nation, and Scotland has a strong maritime heritage, but we are not playing a strong game to make people realise that marine energy is strategically important, environmentally benign and a massive opportunity for the country's economic development.

Joan McAlpine: Would creating that atmosphere help to leverage private sector investment? Would the private sector have more confidence if marine energy had that level of public support?

Neil Kermode: I am sure that that would be the case. In Orkney, we have argued quite strongly for that for a number of years. We get a number of people coming to the site and to the island. Around 57,000 people get off cruise liners every year and walk past two tidal turbines, but we have nothing that interprets that technology. There is clearly an opportunity to inoculate all those people with positive messages about what is going on. [*Laughter*.] Hey—it is called advertising in other forms.

There is a need to positively polarise people so that when their investments, such as their pension funds and the rest, are considering going for marine energy, they have a greater awareness of it. Just as Stephen Salter joined the words "wave" and "energy" together 30 years ago as a phrase, there is something to be done mentally with people now so that they are ready for marine energy when the technology is good to go.

Joan McAlpine: If I could just—

The Convener: Briefly, please, because we are running over time.

Joan McAlpine: Neil Kermode mentioned the cost of the Hinkley pipe. The UK Government has sent out a strong message that, at UK level, it is backing nuclear power and is prepared to invest huge amounts of money. Is the hyping of nuclear power at UK level detrimental to investment in your industry?

Neil Kermode: We are in something of a shadow—that is the problem. The decision is not necessarily about using renewables or nuclear. We have a problem with carbon, and at present the UK Government is rather focused on the nuclear side of things as the central part. However, a lot of strong work is going on in the south-west and in Pembrokeshire, and other areas are keen to make marine energy work and are seeing the value of it. Nonetheless, we do not seem to have the same traction as nuclear does. It would be useful to get ministers up here to see what is going on in marine energy, which we have not managed to do lately.

Dr Wyatt: I will add a few figures that I carry around in my head. The Welsh Government has outlined £80 million for marine energy in its budget, and the Cornwall and Isles of Scilly LEP

has £40 million or £50 million ring fenced for marine energy. There is commitment south of the border, and our challenge is to ensure that we are leveraging that commitment here in Scotland and pulling all the right bits together. Part of my remit for the catapult centre is to ensure that we are doing that.

Joan McAlpine: That is regional, though. I am talking about Westminster.

Dr Wyatt: That is right, but the activity is regional. For offshore renewables—for wave and tidal—the benefits are felt really quite regionally, which is why we sometimes see more engagement at a regional level than at Westminster.

The Convener: I need to bring in Johann Lamont.

Johann Lamont (Glasgow Pollok) (Lab): I have a brief observation to make. Throughout Scotland and beyond, everybody is very good at explaining what energy sources they do not like. In fact, some marine development has come from people arguing against onshore wind farms and saying, "Well, this would be better." What do you think needs to be done at every level? I go back to Patrick Harvie's point about the urgency of war leading to the development of technologies. What do we need to do at a political level to stop arguments on energy being about what we do not like?

People are very inconsistent: they are in favour of renewables until their local community is against them. We have seen that during the lifetime of this Parliament—for example, there was a very active campaign against an onshore development in the Western Isles. What do we need to do politically to promote a proper and positive understanding of what wave and tidal energy offers, rather than have people favour it simply because it is not something else and it is not near people's houses?

Dr Wyatt: To put it simply, we need to get climate change back on the agenda; there is no getting away from that fact. With regard to onshore wind turbines, if I said to you, "You can put up a temporary structure that will generate electricity that will be cheaper than electricity from most fossil fuels," you would jump at the chance. Why are people not doing that?

The same applies to wave and tidal energy, which in a sense is the next onshore wind. We need to put climate change back on the agenda, and in the shorter term we need to bring into play the arguments about security of supply and economic benefit. Those are the three tools that we have to try to bring about a change in public perception.

Johann Lamont: Is there also an argument to be made about a sense of community benefit from such developments? They are often more closely related to quite fragile communities that would benefit economically from them but which do not perceive that to be the case.

Dr Wyatt: I think so. With the islands, it is quite easy to demonstrate that link.

Tim Hurst: If you look at a map of the economically fragile areas in the north of Scotland and you look at offshore renewable energy resource, you see that there is almost a perfect alignment. If we can develop projects in those areas, we can create economic activity exactly where we want to. There is a perfect match in that respect.

Lindsay Leask: It is worth pointing out our polling. We do quite regular polling of people's perceptions of and support for renewables. It is consistently high—we are consistently up at 70-plus per cent and there is consistent support for onshore wind. To address the point that you were making, a lot of the onshore infrastructure that we require for the wave and tidal sectors is driven by onshore wind development, so it is really important that we get across the message that it is not a case of one or the other; the two sectors work together.

As a trade association, we do a lot to get those messages out. What we can do at the moment—I keep coming back to this—is create a UK-wide, overarching strategic plan for the sector over the next few years. We need to work with our colleagues at Westminster to develop something that sets the direction of travel, gives people confidence, puts the sector back up the political agenda and drives us forward. That is crucial.

Neil Kermode: You are absolutely right—we do not want people to run away from another technology in order to come to marine renewables. We need to ensure that people realise that marine renewables are strategically important, that there are real jobs to be had, that it is a sustainable technology and that there is a massive export opportunity.

We are very fortunate. As I said, Orkney is a microcosm. We have ended up with a cluster of between 250 and 300 people—it is a descending number, unfortunately—who are employed in marine renewables as a whole. People in Orkney really get it. They understand that it is of benefit. Everybody knows somebody who works in the industry, so they are willing to give it a bit of a go.

We need to spread knowledge of the technologies more widely. We need to ensure that we can point to the benefits that we have had so far, and those benefits need to be continuous. Tim Hurst made the point that sporadic funding is a

problem, so we need to ensure that it is continuous.

So far, the Aquamarine Power machine has been built at Methil and the Pelamis machine has been constructed at Leith. The blades for the Nova thing are being built in Shetland and the Nautricity device is being built at Port Glasgow. A bunch of stuff is going on, but generally they are one-off events, after which people go away again. People's expectations are brought up then they are disappointed; we need to get rid of the disappointment element. We need sustained activity and we need people to realise that this is Scotland's Apollo programme. We have to get people behind it and ensure that everybody realises that they are contributing to something that is bigger than themselves. That will help us to ride through some of the hiccups that we have had, such as the pothole that we have stepped in at the moment with what is happening with Pelamis. We have not fallen off a cliff; it is just a blip in the road.

Lewis Macdonald: I want to get on record a couple of factual things about Wave Energy Scotland while we have the opportunity. It has been said that the industry has a track record of funds being committed and not spent. How much of Wave Energy Scotland's initial budget consists of funds that were previously committed then not spent because companies went out of business or ceased to operate in the same way? It would be helpful to understand the value and nature of the contract with the former Pelamis staff at Wave Energy Scotland. To return to a previous line of questioning, given that Wave Energy Scotland does not aspire to hold IP in perpetuity, what is to become of the IP acquired from Pelamis?

Elaine Hanton: The budget is not recycled money from the marine renewables commercialisation fund, the WATERS—wave and tidal energy: research, development and demonstration support—scheme or anything like that. It is money from the Scottish Government's energy budget for last year and this year, so it is new money.

Forgive me, what was the second question?

Lewis Macdonald: I asked about the value and nature of the contract with the former Pelamis employees.

Elaine Hanton: That contract, which is with a group of 15 ex-Pelamis employees, is worth £226,000. Its purpose is to capture knowledge and to document as much as possible about the lessons that they have learned over the past 15 years—what has worked, what has not worked, where they got to with the technology, where they would have gone next and where they got to in terms of certification. Basically, we want them to write down as much as possible of what is in their heads so that we can add some value to the IP that we have acquired.

The IP and physical assets that have been acquired will be made available to anybody who comes into the WES programme. We want to use them to support the industry's growth in whatever way is appropriate. We have not been prescriptive. We have the IP, it is available to use and we want it to be used.

Tim Hurst: As part of that contract with the ex-Pelamis people, we have looked at trying to extract the best parts of the technology and seeing which bits of it can be taken forward into the WES programme and either slotted into other technologies or developed as standalone subsystems. More than £90 million has been invested over the past 15 years, so our specific focus is the value that we can take from that and develop for the future. We are specifically looking at the future of that technology programme.

11:45

Elaine Hanton: The results of that work will be made available.

Tim Hurst: Yes. They will be publicly published.

Lewis Macdonald: Do I understand it from what you have said thus far that your line of accountability is to HIE and that you will be audited as part of HIE?

Elaine Hanton: That is right. WES has been set up as a subsidiary of HIE. It will operate under HIE's operating and governance framework and HIE's chief executive is the accountable officer. All of HIE's reporting, monitoring and other systems and frameworks will apply to Wave Energy Scotland, which will report to the HIE board on progress and, through it, back to the Scottish Parliament and the Scottish Government.

Lewis Macdonald: That remit is specifically and exclusively for wave energy. You will continue to support tidal energy in other ways.

Elaine Hanton: That is right.

Lewis Macdonald: We have heard many positive things about tidal energy—that it is close to first array and that some of the issues that we have heard about in relation to wave energy have not arisen so far. Lindsay Leask was very positive about it. Would other panel members confirm that they are equally confident that the development of tidal energy, as distinct from wave, is at the point at which it is realistic to move towards commercialisation? Are you confident that issues to do with running before you can walk, which have hit wave energy, will not get in the way at this critical stage?

Elaine Hanton: Yes. We would absolutely agree with the points that have been made. With the MeyGen project, onshore works and offshore drilling have started. We are looking to start deployment from next year and to have all four devices in the water and commissioned by 2017.

That is not to say that there will not be further technical challenges and hitches—there is a lot more learning to be done—but we agree that the tidal sector is at a different stage and is that bit further forward. I guess that that is because it is more of a known technology. Industrialists understand it. There has been design convergence, which there has not been in the wave sector. That has made a massive difference. [*Interruption*.] I apologise on behalf of Tim Hurst and me. Both our phones have gone off. Please accept our apologies.

Dr Wyatt: I do not think that we are home and dry with tidal energy. The first project has reached final investment decisions and we are starting to do some of the land works around that. There is a bit of a way to go yet before we have energy generating.

There is another step. Once we have put those five devices in the water, we need to configure the next phase, which will be significantly greater. With the advent of Wave Energy Scotland, the Offshore Renewable Energy Catapult has focused a lot harder on tidal energy and on working with those that are looking to develop the projects and the technology to overcome barriers relating to the first project and beyond. There is a bit more work to do.

Lindsay Leask: I want to make the distinction between where wave is and where tidal is. I agree that tidal is not home and dry yet. By no means do we take any of the success for granted. There is a long way to go.

The MEPB report that I referred to earlier recommends an innovation programme for tidal, which it suggests should be focused on cost reduction. That is a big thing that the tidal sector will focus on.

The Convener: Can I ask one last question on wave power? We talked earlier about how we are 15 years in. It is now 2015. If you were to come back to the committee in 2025, what would you be telling us? Would you be telling us that we were at a stage at which wave power was commercially viable or would you be saying that you were still facing difficulties and that you needed more public money? What is your best guess?

Tim Hurst: I would say that it would be commercially viable by 2025.

Neil Kermode: I am just curious about the fact that my microphone light went on first.

We would point to the successes that we were having. We would say that there were things going on and that there were machines out there that were working. We will face some technical challenges that will start to come home to roost after the machines have spent a number of years in seawater. That is inevitable. I think that we would say that we wanted some money, but not for the same sorts of things; money will be needed for a variety of things.

I think that we would also be able to point to a much bigger group of people who could show you what was going on. By then, it will not just be a small group; the sector will have achieved critical mass.

Dr Wyatt: I agree with everything that people have said. We would be coming back to talk to the committee about a number of successes. We would also be asking what more we could achieve. We would be saying, “Help us with this cost reduction journey. Let’s maximise the opportunity that Scotland, the UK and Europe have in the wave energy sector, because it is now really tangible and we are there delivering.”

Stuart Bradley: I am really looking forward to hearing what the first programmes through WES will deliver. There is a lot for us to gain from those. I am also really looking forward to seeing what happens with the first power take-off innovation call.

The Convener: It has been a long session, but you have answered our questions very comprehensively. On behalf of the committee, I thank you all for coming along this morning.

11:50

Meeting continued in private until 12:06.

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