



# **Cynulliad Cenedlaethol Cymru** **The National Assembly for Wales**

## **Y Pwyllgor Amgylchedd a Chynaliadwyedd** **The Environment and Sustainability Committee**

**Dydd Iau, 7 Mawrth 2013**  
**Thursday, 7 March 2013**

### **Cynnwys** **Contents**

Cyflwyniad, Ymddiheuriadau a Dirprwyon  
Introduction, Apologies and Substitutions

Nwy Siâl a Nweiddio—Tystiolaeth gan UK Onshore Gas Limited  
Shale Gas and Gasification—Evidence from UK Onshore Gas Limited

Nwy Siâl a Nweiddio—Tystiolaeth gan UCG Association a Clean Coal Limited  
Shale Gas and Gasification—Evidence from UCG Association and Clean Coal Limited

Cyfoeth Naturiol Cymru  
Natural Resources Wales

Nwy Siâl a Nweiddio—Tystiolaeth gan Ganolfan Tyndall  
Shale Gas and Gasification—Evidence from the Tyndall Centre

Nwy Siâl a Nweiddio—Tystiolaeth gan Gyfeillion y Ddaear  
Shale Gas and Gasification—Evidence from Friends of the Earth

Yn y golofn chwith, cofnodwyd y trafodion yn yr iaith y llefarwyd hwy ynnddi. Yn y golofn dde, cynhwysir trawsgrifiad o'r cyfieithu ar y pryd.

In the left-hand column, the proceedings are recorded in the language in which they were spoken. The right-hand column contains a transcription of the simultaneous interpretation.

**Aelodau'r pwyllgor yn bresennol**  
**Committee members in attendance**

Mick Antoniw	Llafur Labour
Keith Davies	Llafur Labour
Yr Arglwydd/Lord Elis-Thomas	Plaid Cymru (Cadeirydd y Pwyllgor) The Party of Wales (Committee Chair)
Russell George	Ceidwadwyr Cymreig Welsh Conservatives
Vaughan Gething	Llafur Labour
Llyr Huws Gruffydd	Plaid Cymru The Party of Wales
William Powell	Democratiaid Rhyddfrydol Cymru Welsh Liberal Democrats
David Rees	Llafur Labour
Antoinette Sandbach	Ceidwadwyr Cymreig Welsh Conservatives

**Eraill yn bresennol**  
**Others in attendance**

Yr Athro/Professor Kevin Anderson	Dirprwy Gyfarwyddwr, Canolfan Tyndall Deputy Director, Tyndall Centre
Tony Bosworth	Uwch-ymgrychyd Newid yr yr Hinsawdd ac Ynni, Cyfeillion y Ddaear Senior Climate Change and Energy Campaigner, Friends of the Earth
Dr John Broderick	Cymrawd Ymchwil, Canolfan Tyndall Research Fellow, Tyndall Centre
Gareth Clubb	Cyfarwyddwr, Cyfeillion y Ddaear Cymru Director, Friends of the Earth Cymru
Dr Shaun Lavis	Uwch-wyddonydd Daear, Clean Coal Ltd Senior Planning Adviser Geoscientist, Clean Coal Ltd
Naomi Ludhe-Thompson	Ymgynghorydd Cynllunio, Cyfeillion y Ddaear Planning Consultant, Friends of the Earth
Professor Peter Matthews	Cadeirydd, Cyfoeth Naturiol Cymru Chair, Natural Resources Wales
Dr Emyr Roberts	Prif Weithredwr, Cyfoeth Naturiol Cymru Chief Executive, Natural Resources Wales
Oliver Taylor	UK Onshore Gas Ltd
Gerwyn Williams	Cadeirydd, UK Onshore Gas Ltd Chair, UK Onshore Gas Ltd

**Swyddogion Cynulliad Cenedlaethol Cymru yn bresennol**  
**National Assembly for Wales officials in attendance**

Alun Davidson	Clerc Clerk
Catherine Hunt	Dirprwy Glerc Deputy Clerk
Graham Winter	Y Gwasanaeth Ymchwil Research Service

*Dechreuodd y cyfarfod am 9.35 a.m.  
The meeting began at 9.35 a.m.*

### **Cyflwyniad, Ymddiheuriadau a Dirprwyon Introduction, Apologies and Substitutions**

[1] **Yr Arglwydd Elis-Thomas:** Bore da, a chroeso i'r pwyllgor. Mae gennym ymddiheuriad gan Julie James.  
**Lord Elis-Thomas:** Good morning, and welcome to the committee. We have received apologies from Julie James.

### **Nwy Siâl a Nweiddio—Tystiolaeth gan UK Onshore Gas Limited Shale Gas and Gasification—Evidence from UK Onshore Gas Limited**

[2] **Yr Arglwydd Elis-Thomas:** Mae'n bleser gen i groesawu Gerwyn Williams ac Oliver Taylor sy'n rhoi tystiolaeth ar ran UK Offshore Gas Cyfyngedig. Diolch iddynt am eu papur.  
**Lord Elis-Thomas:** It is a pleasure to welcome Gerwyn Williams and Oliver Taylor who will be giving evidence on behalf of UK Offshore Gas Limited. I thank them for their paper.

[3] David Rees, would you like to lead our questioning on this?

[4] **David Rees:** Thank you, Chair. The UK Government's gas strategy states:

[5] 'If it can be shown to be economic and safe, domestic shale gas production could offer a significant economic opportunity.'

[6] I want to swap the words 'economic' and 'safe' around, and put 'safe' first. Can you therefore tell me whether you are convinced that it is safe and what evidence you have to support that? Secondly, is it economically worth while?

[7] **Mr Williams:** First, thank you all for inviting us here this morning and giving us the opportunity to give evidence. It is much appreciated. The answer to your first question is 'yes', it is safe and it has been proven to be safe by a working party set up by central Government that has spent over a year on this and has produced a number of reports. The first thing to say is that there has been a lot of bad press about shale gas, which started in the USA. There have been problems with shale gas in the USA: there is no denying that. The difference between the UK and the US is that there are different sets of legislation. We are far better governed in the UK than the industry in the USA is. The baseline for that is that there are no baseline studies taking place in the USA, so, when things happen—for example, when people find methane in their water—because baseline tests were not taken before drilling started, there is nothing to prove that the methane was not there before. The British Geological Survey is working with all of our competitors, if you like—the people working in the industry—to do these baseline tests before the industry starts off.

[8] The other thing is that there is total transparency. We have an association called the United Kingdom Onshore Operators Group and we are setting guidelines that will make everybody work to the same standards. We have to tell organisations such as the Environment Agency and local authorities exactly what we are going to use in any frack fluid before we will be able to use that—not that we will be ready to frack for some time yet. So, there are set standards and they are more rigidly governed in the UK than they are in the USA. As far as the economics of the industry is concerned, we believe that, because of the work we have done so far, we can extract the gas economically and it would be of huge benefit for Wales in kick-starting the economy and providing jobs. There are numerous reports, but Pennsylvania State University issued a report in 2010, estimating that something like 44,000 jobs would be

created. By the end of 2011, there were 234,800 people working in the Marcellus Shale industry in Pennsylvania alone. I have the figures here. The estimated potential in added revenue is £10 billion; 100,000 jobs and nearly £1 billion in state and local taxes. If they can do it there, we can do it here. We have very thick shales in Wales, which the USA does not. We have more to go at and the shales are of better quality. So, if the USA can do it with thinner shales of lower quality, the answer is 'yes', we can do it here and it will be economic.

[9] **David Rees:** I am sure that my colleagues will want to come back with some questions on those points as well. You referred to the central Government working party, but I have read that the European Commission is still undertaking a review into this and still has some concerns over it. In fact, some countries in Europe have put a moratorium on it.

[10] **Mr Williams:** France has put a temporary moratorium on it, yes—whether that moratorium will be lifted or not I do not know. All we can go by is our own Government. The Royal Academy of Engineering has also issued a report, and, from the work that it has done, we are absolutely satisfied that it is safe for this industry to go ahead. All we are doing at this stage is exploration work: drilling, coring and finding out what we really have in terms of coal, shales and, in fact, conventional reserves, which people have ignored. There is some unconventional gas, which includes coal-bed methane and shale gas, but there is also the potential in the Devonian measures for conventional gas that does not need fracking, and that is what we have applied to do in Llandow. There may be oil in certain places. We drilled shales in Banwen last year, and the results looked more like oil-bearing than gas-bearing shales.

[11] **William Powell:** Good morning to you both. You have referred to the Llandow and Banwen sites. I want to ask a broader question about the scale of shale gas that has been identified across Wales. Also, what other locations are looking initially favourable from the studies that you have done?

[12] **Mr Williams:** First, we have two companies. The holding company is UK Onshore Gas Ltd, which owns UK Methane Ltd and Coastal Oil and Gas Ltd 100%. Those two companies cover licence areas in south Wales of 1,060 sq km—that is, 260,000 acres—which stretches from Swansea, more or less, to Llantwit Major. It is cut off by the coast, and Banwen is the northern, top end of the licence areas.

[13] The first thing to say is that we have not just appeared in this industry. I applied for the first coal-bed methane licence in Britain, and obtained it in 1993. So, we have been working on coal-bed methane in south Wales for 20 years. It is nothing new; we have put a massive amount of work in, and we have never had any borrowing. We have had equity partners, and have spent a lot of time and a lot of our own money to get to where we are today. To answer your question, there are areas of land that we have tied up in terms of drilling. We have two large estates of over 1,000 acres each with which we have signed large agreements to drill on. We have one in the Swansea area, which is over 14,000 acres, containing around 146 farms. We then have various other land agreements signed on industrial and smaller farms throughout south Wales. We also have another site more or less signed up in Llandow.

[14] Therefore, we have plenty of surface area to go at, with the licences to cover it all. We have planning permissions to drill on Llys Nini, which is the RSPCA site in Penllergaer; we have planning permission to drill in the forestry in Cwmafan; we have the planning permission at Llandow; we have applied for planning permission to drill near the old Coedely colliery in north Llantrisant; and we have a number of further sites that we have identified for which we have planning permissions ready to drill.

[15] So, we will soon be ready to drill on another six sites in south Wales. To date, we

have drilled in the docks at Port Talbot, which is alongside the Tata steelworks, of course; we have drilled in Lletty Brongu, which is near Llangeinor, near the Georgia-Pacific paper mill; and we have drilled in Pencoed, near the Rockwool site—the philosophy being that, if there is gas there, we produce it and take it straight to an end-user, which cuts their manufacturing costs.

[16] **William Powell:** Thank you for outlining that. You obviously have quite a suite of planning permissions in the lockers, as you have just described. What are the principal obstacles that you face in taking this forward on a larger scale in your view and in the view of your colleagues?

[17] **Mr Williams:** We have drilled six holes already. We drilled five exploration holes, and one production well at Lletty Brongu. We had only the second field development plan for coal-bed methane approved in the UK to enable us to do that. That was to drill a production well, take over an old farm building, put in generators in the farm building, and generate electricity from the gas produced. So, we have actually drilled a production well there. I do not see any problems in obtaining permissions to drill in coal, and I do not see any problems in getting permissions to drill for conventional gas, as far as planning officers are concerned, or the Environment Agency. They are certainly satisfied with what we presented to them. People will be very concerned when we put in an application—it might be two or even three years away—to actually stimulate shales and frack. There is concern now. All I would say is that, during the period that we are carrying out this exploration work, people like Cuadrilla will be breaking the ice. They will be carrying out the same work; IGas Energy will probably be carrying out ground stimulation as well, so we will be able to learn from them. We will not be the first people to jump in and do it. If we have permitting problems, it will be when we come to actually frack.

[18] **William Powell:** One final question for now, Chair, if I may. What thoughts do you have as to the potential impact of your sector on the viability of onshore wind and other renewable sources of energy? The whole market has been radically changed in the United States of America as a result of fracking. I wonder if you have given any thought to that issue.

[19] **Mr Williams:** Yes, we have. We do not see gas as the be-all and end-all solution to the energy problems that we face. By 2015, there are coal and oil stations that will close due to emissions, so we will have a gap in generating capacity. By that time, we will need to build new stations or we will suffer power cuts; there is no doubt about that. We see gas as a bridging fuel. I will read a short piece on that in a minute. We believe that gas can work hand in hand with renewables. We see huge potential for tidal electricity generation around the coasts of south Wales, and there is obviously potential for wind. The wind does not blow all of the time. We do not have a smart grid. The grid cannot pick up where the load is required, and where we can get electricity generated from, so we have to have this back-up all of the time. The only way to do that, as I see it, is to get the gas out and produce our own gas rather than import gas, as we do now.

[20] I will just read from a short article about evidence that Ernest Moniz, who is a physicist at the Massachusetts Institute of Technology, gave to the US Senate. He has actually just been nominated as the US energy secretary. He says that gas is the only alternative bridging fuel. In the USA, the article says,

[21] ‘Here’s how this “bridge” is supposed to work: In the near future, cheap natural gas will elbow aside coal in the U.S. electricity sector. Since burning natural gas for electricity emits about half the carbon-dioxide that burning coal does, this will curtail U.S. emissions a bit...That, in turn, buys us some time to make the more arduous shift to even cleaner forms of energy, like solar or wind or even nuclear.’

[22] If you look at Texas, which is probably one of the biggest oil producers among the gas-producing states in the USA, last December, 28% of its electricity was produced from wind power. So, it is a matter of working together, not fighting each other, as we see it, for the benefit of all.

[23] **Lord Elis-Thomas:** David Rees and then Vaughan Gething on this point, please.

[24] **David Rees:** You mentioned all the planning permissions that you have. Is that for shale gas exploration or conventional gas exploration?

[25] **Mr Williams:** One is for conventional exploration, in Llandow, and the rest, apart from one, are for coal-bed methane. We have one in Coedely for coal-bed methane and the Namurian shales. Just to give you an idea of the targets we have in south Wales for gas production, within the coalfield, when all of the coal seams are in place, there are 137 seams. We are concentrating on the 15 that British Coal worked the most, because they are the thickest and we have the most information on them. Under that, we have a thick band of shales, and then we come to the Namurian measures, which contain 11 sets of shales. That was drilled in 1942 by Anglo American as part of the war effort to look for oil. Below that we have limestone, and the lower limestone shales. Below that again we have the Devonian measures that contain conventional gas or oil, and below that the Silurian measures, and below that the Ordovician measures. So, there could be enormous amounts of gas in south Wales.

[26] What we are doing is to take this on a progressive basis, to try to bring people along with us. Nobody really objects to coal-bed methane. I worked for British Coal for 22 years. I worked in a lot of the collieries in south Wales, and people are used to coal, coal mining and drilling. We do not see any problem with that. We may have some objection, as I said, on the Coedely borehole, because we are drilling into the Namurian shale, but it is only that one, to answer your question, that is for shale exploration at the moment.

[27] **David Rees:** Okay, thank you for that. You mentioned two that in my constituency: Port Talbot and the Afan Forest area. There are other proposals in that area, such as underground coal gasification in Swansea bay, the Tata works and the possibility of mine workings. How does this all impact as a collective within a small area?

[28] **Mr Williams:** It should work absolutely hand in hand. In the USA, coal-bed methane production was started by Walter Energy in the late 1960s to early 1970s. Because the mines were so gassy, they decided to drill from the surface and degas the mining areas before they started. So, if you get a coal-bed methane drilling programme over the new Margam mine development, perhaps, you will see a number of things happen: you will get good geotechnical information on the roof, the seam and the floor for the mining project; it will degas the area before mining starts, and that will make it safer and more economical to work, because the ventilation costs in the mine will be lower. Also, when it starts, the mine working will cause cavities—when you mine coal, it causes cavities, which causes natural breaks in the seams above, and that will increase permeability and gas production from the seams above. So, coal mining and coal-bed methane are meant to work together; that is how it all started. There is no conflict there at all.

[29] When it comes to underground coal gasification, I know that people will be speaking on this subject later, but there can be the same benefits from the gasification of some seams in the areas that we are trying to obtain coal-bed methane from. A number of years ago, I drew up what I called ‘the carbon dioxide cycle’. If you take carbon dioxide and sequester it in the ground, it helps methane to detach from the coal. So, if you have an underground coal gasification programme causing voids in the bottom seams, this produces a syngas. You get carbon dioxide out of the syngas, inject that back into the ground, where your coal-bed

methane is working, and you do two things: you get rid of the carbon dioxide, and you produce more coal-bed methane. So, again, as with renewables, it is a matter of joining everything up and making each work for the benefit of the other. I do not see any major conflicts at all.

[30] **David Rees:** I can assure you that Tata has done its work as well; do not worry about that.

[31] **Mr Williams:** Yes, I know.

[32] **Lord Elis-Thomas:** This is a new area for us as a committee. We spent a lot of time on energy policy last year, and mainly concentrated on renewables and more conventional sources of energy. You are leading us to the argument—which interests me, because of my family background further west in the coal industry—that you are making, which is that this is part of the geological development of extractive industry in the south Wales coalfield and that, therefore, this is not some unnatural form of development being inflicted on an area that has not had previous development.

[33] **Mr Williams:** When I worked for British Coal, we had our own internal gas grid, which was some 40 miles long. We took gas from Afan, Glyncoerrwg, Blaenant, Coegnant, Caerau, International, Ffaldau, Garw, and Coedely and we fed the East Glamorgan General Hospital and Treforest industrial estate. It was very high purity methane—90% to 95% methane, with some ethane and propane. So, we know that it is good gas. We have already drilled for it; we had people over from a company called Ticora from Denver to set up laboratories with us where we have been drilling and the quality of the gas has been tested. We know it is there, we know how much is there, and we know that it is good-quality gas.

[34] **Vaughan Gething:** I want to go back to the point that you made at the start about this being safe. I think that there are two distinct things here. There is coal-bed methane, which I am a lot less concerned about, and I think that the public generally does not have concerns about it, particularly as, I note, there is not usually a requirement for fracking. It is fracking in particular that causes concern. You refer to a Royal Academy of Engineering report that said that shale gas was safe, but I want to be clear about two safety points. There is one about the geological point and the tremors, and I know that there was a report said that it may be safer than we think. However, I am rather more concerned about the potential for water pollution with regard to what you have to pump into the rock to get the gas out, and what happens when it goes into the rock. Not all of it will come back out at the end, so I am more interested in what you have to say about the safety of the solution that you put in and take out, and how that is disposed of.

[35] **Mr Williams:** As I said earlier, the United Kingdom Onshore Operators Group has issued guidelines, and all operators have to be totally transparent in terms of the fluids that are used. Modern frack fluid is only 0.4% chemicals, and all those chemicals can now be used in the food industry. So, there is no potential for chemicals that are used in modern frack fluids to contaminate water. It is exactly the same for drilling fluids when you drill the initial hole. We use Pure-Bore, and if we were to drill a water well for Welsh Water, Affinity Water or anyone else, we would use exactly the same fluids. There is nothing in the chemicals that can pollute water.

[36] Fracking hydraulically is not the first stage for us. As you said, there is no real need to frack for coal-bed methane if you have the right permeability. For coal-bed methane wells, if you drill directional wells in the coal, you should get coal-bed methane when the permeability is right. People are getting used to drilling rigs on site.

[37] The next stage is to look for a set of shales such as the Namurian shales; we know

that we have 350m of those shales. If you put those at the right depth and use a different fracking medium—we would use nitrogen rather than water—people will get used to fracking with nitrogen. That is common practice for the Chattanooga shales in Tennessee, and it works very well. You cannot use nitrogen fracking as you go deeper, because the ground pressure gets higher and you need more pressure. Ultimately, if you want to get gas out of the deeper measures, you have to use a hydraulic frack.

[38] In south Wales, because of the faulting and the way in which the coal is a basin—literally, as the coalfield is 70km east to west and 22km north to south—everything dips towards the middle from the north, south, east and west, and there are couple of major structures running east to west. When you come out of the coalfield, the same trends are there. We also have a huge variance in topography, so we are lucky—we can pick different areas where we can drill these different targets at the depths that we want. For example, for the lower measures, such as the Silurian and Ordovician shales, which you will often frack, no-one has ever sampled this for unconventional gas in the UK yet. In the area west of Cardiff and the north of Vale of Glamorgan, those Silurian and Ordovician shales are quite close to the surface. We know that something like 9% of the world's oil is produced from those measures elsewhere in the world.

[39] So, to answer your question, we are going to take this gradually and drill for coal-bed methane first, using a different fracking method next, and ultimately get to using hydraulic fracking. However, by that time, other firms such as Cuadrilla and IGas Energy will have hydraulically fracked and will have proven that it is safe.

[40] **Vaughan Gething:** I want to stick with hydraulic fracking. You said that only 0.4% of frack fluid is chemicals, and that you can use them all in food, so it is safe.

[41] **Mr Williams:** That is what the Government report says; that is where we have taken that from.

[42] **Vaughan Gething:** Is there any other objective evidence of where that has been used and what its impact has been? Have you had any discussion with the Environment Agency—it is nearly natural resources Wales, but not quite—about its view on permitting? In Llandow, Welsh Water had concerns about hydraulic fracking, so this is not a fringe group of people that are looking to stop you; there are some pretty mainstream concerns about the safety issue.

[43] **Mr Williams:** The Environment Agency has produced a set of guidelines for coal-bed methane and for shale gas. We have something to work to. I would not like to say how many meetings we have had with the Environment Agency, but the answer is 'a lot'.

10.00 a.m.

[44] **Lord Elis-Thomas:** If you hang around you will see the new agency. [*Laughter.*]

[45] **Vaughan Gething:** That is a few weeks away.

[46] **Mr Williams:** We work very closely with it. It has issued guidelines and it is satisfied with the whole process at the moment.

[47] No-one has ever fracked with nitrogen in the UK. We have spoken to Linde or BOC—whichever it was—about supplying us with nitrogen, and we have spoken to a company in Holland about supplying us with nitrogen pumps. All of that can be put together. That is the next stage to coal-bed methane. On hydraulic fracking, I could not believe it, but I had a call last week from a company of insurance brokers in Swansea saying, 'We have another client working in the water part of your industry. Would you like to meet him?' The



chap's name is Peter James—I cannot remember the name of the company, because I have not met him. The company is in Newport and it manufactures ballast tanks and recycling equipment for water taken out of fracking systems. So, in Newport, we will have someone who can work with us and who will be able to deal with water, when we recover it, and treat it on-site. We will then be able to discharge it, with a discharge licence from the Environment Agency, back to where it came from.

[48] I will give you a comparison on the amounts of water that are used. On average, 18,000 cu m of water would be needed to stimulate a well, which is equal to the volume used to irrigate a three hectare cornfield in a season or an 18-hole golf course in a month. However, most of that, as I said, can be recovered and reused. We can manage all of those things. We will not manage it overnight, and we will not go from A to Z overnight, but we do know that we have a massive resource in Wales and it is a matter of managing that risk to get the benefits out of that resource.

[49] Again, to give you an idea of what we are chasing, we have had two reports carried out; one by RPS in Dallas, in the United States, on the shale potential, and one by Resource Investment Strategy Consultants in Perth, in Australia, on the coal-bed methane potential. RPS in Dallas came up with the figure of 49.87 billion cu ft in one part of the shales in one part of south Wales. That is just under 50 trillion cu ft in place, and the UK uses around 3.5 trillion cu ft per year. So, if we took a third of that out—say 18 trillion cu ft—we are looking at six years' supply for the whole of the UK. RISC came up with 1.65 billion cu ft, so that is 1.5 trillion cu ft of coal-bed methane. So, we have only just scratched the surface of that. We could be talking of hundreds of trillions of cubic feet, which would enable us to do the same as America. America has 100 years of indigenous gas supply, and it is turning around its liquid gas importation terminals to export gas. We can do the same thing. There is a big prize for everyone in Wales at the end of it, if it works.

[50] Wherever there is risk there will be a reward. UKOOG is putting pressure on central Government, via the Treasury, to get money—taxes and the business rates that we pay—diverted from central Government back to Wales and back to local authorities. So, the cash benefits can be seen in the development areas. I think that the same is being done with the nuclear industry, and there will probably be an announcement in the next few days in relation to those benefits.

[51] **Lord Elis-Thomas:** A lot of us will be looking forward to that. I now call on Russell George.

[52] **Mr Williams:** I know that a letter went from our association to the Treasury earlier this week.

[53] **Russell George:** Good morning. I think that it was David Rees who asked some questions earlier about economic viability, which also exists in the context of Government subsidy and the taxpayer making certain forms of energy viable. What are the potential costs of Welsh shale gas compared with oil, coal, renewables, wind, wave or solar in the context of Government subsidy?

[54] **Mr Williams:** We have not had any Government subsidies in this industry. We have never had any grants; we get the same amount of money per megawatt of electricity that we generate from shale gas or the thousands of cubic feet of gas that we sell as somebody gets from the North sea. We do not get any benefits like that. We know renewables that do; coal does not and oil does not. If it is anything like the USA—in 2011, electricity and gas prices here went up by 30% on average—the gas price in America has dropped from around \$6 per 1,000 cu ft down to \$2 per 1,000 cu ft. I think that the same will happen with gas here, but I do not think that it is going to drop electricity prices dramatically, because we have a shortage

of generating capacity, which is why we are splitting our sales plan between gas and electricity. So, the answer is that we should produce cheaper gas and we are not asking for any subsidies.

[55] **Russell George:** So you are asking for no subsidy at all. Subsidies can sometimes be hidden.

[56] **Mr Williams:** No.

[57] **Russell George:** I know that RenewableUK, in conjunction with the Welsh Government, produced a report a few weeks ago about the level of jobs that can be created in the renewables sector. Can you talk about the economic opportunities and job creation that shale gas can bring, in Wales particularly?

[58] **Mr Williams:** I can talk about it, but I have no idea how many jobs would be created. I have tried to think about it and I know that, in Pennsylvania, nearly 0.25 million jobs have been created. Cuadrilla has said that it would create 5,600 jobs in the Lancashire area of north-west England. It is all in the spin-off things—the steel mills are reopening in Pennsylvania, there is the production of pipe, there is road surfacing, and it even goes down to bales of hay and fencing. There are so many different levels of services required and we do not have those services in the UK, so it is going to be a matter of building those up, and every one that we build up would create more jobs.

[59] **Russell George:** So, would you welcome resources from Welsh Government in helping you to carry out that research?

[60] **Mr Williams:** Yes; very much so.

[61] **Lord Elis-Thomas:** He is not in Government yet, so he cannot give you anything. [*Laughter.*]

[62] **Mr Williams:** I suppose that the other point to make is that, as well as electricity and gas prices going up, something that we are all suffering from is that a gallon of petrol costs £6.50. I have run Land Rovers on gas for a long time, but this gas can be used to fuel any spark-ignited vehicle or engine, with a lower emission rate than petrol. I am going forward a bit to come back, but if we blend some 6% hydrogen back into that gas, and create a fuel called hythane, we would drop emission rates by about 26% and probably the cost of fuel by at least half, I would say. So, that is another big field in which we can drop costs and, again, create more jobs.

[63] **Russell George:** I have one last question. We have witnesses later today from Friends of the Earth; what are they likely to say to us that you may dispute?

[64] **Mr Williams:** I do not think that they take a far enough view—

[65] **Lord Elis-Thomas:** That is a leading question. [*Laughter.*]

[66] **Russell George:** We are taking evidence from you first, so we might use evidence from what you say to us with them later. I wanted to give you the opportunity—

[67] **Mr Williams:** It will say, and it is right in what it says, that gas is a fossil fuel and that we should be getting out of fossil fuels altogether and totally into renewables. However, engineering facts say that we cannot do that overnight. The reality is that we are never going to be able to totally depend on renewables. I agree that we should invest in more tidal schemes in Wales. Two years last January, there was a massive depression and it was freezing

cold—you are in the middle of a depression and there is no wind. However, they cannot see what we can see, given that we are involved in this technology all of the time and we see gas as a bridging fuel and no more than that. If you look at the make-up of gas, it is CH<sub>4</sub>—four molecules of hydrogen and one of carbon. Our ultimate aim is to change from burning gas as a fuel to using the methane gas as feedstock. Our partners in Australia are already doing that. We split the methane into its component parts of carbon and hydrogen, so we have hydrogen as an emission-free fuel. You can fuel fuel cells with it, but I do not think that it would be even worth thinking of hydrogen cars, because you would just generate electricity from hydrogen and have electric vehicles.

[68] We take out the big bad boy in all of this, namely the carbon; it comes out in the form of either single-walled or double-walled nanotubes so that we can spin carbon fibre out of it. So, we can make lighter vehicle bodies and lighter aircrafts, so we use less fuel and we have got emission-free fuel. That is what we are aiming for and we are quite happy to share this with the Green Party and Friends of the Earth and show them how it all works. However, we are not going to get to that point overnight. That is probably 20 years away.

[69] **Mick Antoniw:** The paper that you presented is very interesting. I am quite interested in how you have developed and moved away from the transition from the coal industry into abandoned mines and extracting methane and so on. You have been involved in this area of production for 20 or 30 years.

[70] **Mr Williams:** I left British Coal in 1987 and became involved in private coal mining and coal-bed methane extraction. However, coal-bed methane extraction was not possible then, because until the privatisation of the coal industry in 1994, the gas was regarded as a by-product of coal and, therefore, owned by British Coal. So, we worked slowly through it. We always knew that there was potential under the coal for other gases, because of where we worked in Llandow; we were there because Shell shot seismic lines there in 1982. It layered over the Cowbridge anticline and all under the Vale, and Shell believed that there was potential for conventional gas. So, it has been a matter of evolving slowly. We are now in the position of being able to drill all of these different targets at the appropriate depths, analyse them and then come back and say, 'Well, this is what we have got'. We know that the British Geological Survey is prepared to report and that it has given a report to the Government, which is supposed to say—and this is all hypothetical at the moment—that we were wrong in the first place and that we probably have 1,000 trillion cu ft or more, or a hundred years' worth, of shale gas in the UK. That is due to be published at some time, but I do not know when.

[71] **Mick Antoniw:** You are the major operator in this field in terms of licences and control of access to underground gas.

[72] **Mr Williams:** Yes. The licences are exclusive; we have them on a 50/50 basis with our partner, Eden Energy, in Australia. However, that is likely to change in the near future so that the two 50s become 100 with merger interests. However, we are the operator and we do the work.

[73] **Mick Antoniw:** So, it is fair to say that you are pretty much in a monopoly position in terms of the potential for development.

[74] **Mr Williams:** Yes, we are. The licences are exclusive; we have met the commitments on the major licences and we will meet the commitments on the other licences.

[75] **Mick Antoniw:** I am on a bit of a learning curve on this, but how long do the licences last?

[76] **Mr Williams:** The licences are in three terms: there is a first term of six years, a second term of five years and the third term is 20 years, but we can extend it.

[77] **Mick Antoniw:** So, in terms of the market position, the prime and optimum position for your company is now, because the technology has developed and the market, price and need for energy is such that you need decisions to proceed on extraction now, otherwise an opportunity is lost.

[78] **Mr Williams:** Yes, but I would not rush into it, to be honest. We are all here in south Wales, including Composite Energy. We do not have the expertise on fracking; we have to buy that expertise in, but I have noticed that there is a company called GreyStar UK in Resolven and it provides a service to most of the shale gas industry in the US. In Newport, we have someone who does all the water and in Resolven, we have someone who does all the fracking part of it.

10.15 a.m.

[79] So, there is expertise in south Wales that we do not have in our own company. Cuadrilla is very well funded; it is nearly all Americans who have worked in the shale gas industry. They are the people who had the problems in the first place. Sorry, Mr Gething, I did not answer one of your questions. I will come back to that now. So, we will leave them to plough on and break the ice and we will go on a step-by-step basis with coal-bed methane and nitrogen fracking.

[80] **Mick Antoniw:** What is the status of your company at the moment? In your helpful paper, you describe UK Onshore Gas Ltd as the holding company of Coastal Oil and Gas Ltd and UK Methane Ltd. What is the financial base of the company? Who are the owners? What is the structure of it? What are its links with foreign producers?

[81] **Mr Williams:** I own 90% of the company, 5% is owned by the rest of my family, and in family trusts, and 5% is owned by a company of a friend of mine, Sigma Explorations Inc., which operates gas and oil wells in the USA. We are very well funded because, in parallel to this, we have sold mining assets. We are probably better funded than most companies at the moment. We are in the process of taking control of an alternative investment market-listed company. As part of putting the two 50s together, we will get into an AIM-listed company and we will be bringing some institutional investors on board.

[82] **Llyr Huws Gruffydd:** Rwyf am ofyn fy nghwestiwn yn Gymraeg. Rydym wedi derbyn tystiolaeth fel pwyllgor sy'n dweud, os ydym yn mynd i weld buddsoddiad sylweddol yn y dechnoleg ffracio a nwy siâl, na fyddwn yn cwrdd â'n goblygiadau o safbwynt allyriadau nwyon tŷ gwydr dros y blynyddoedd nesaf. A ydych yn cydnabod hynny?

[83] **Llyr Huws Gruffydd:** I will ask my question in Welsh. We have received evidence as a committee that, if we are to see significant investment in the technology of fracking and shale gas, then we will not meet our obligations in terms of reducing carbon emissions over the next few years. Is that something that you recognise?

[84] **Mr Williams:** Do you mean that if we do not invest we will not meet them, or if we do invest we will not meet them?

[85] **Llyr Huws Gruffydd:** If we do.

[86] Os oes buddsoddiad ac os yw'r dechnoleg hon yn cael ei hecsploetio, a fydd hynny'n golygu na fyddwn yn cwrdd â'r

[87] If there is investment and if this technology is exploited, will that mean that we will not meet our targets in terms of

targedau o safbwynt allyriadau?

emissions?

[88] **Mr Williams:** I do not think that that is true, because the investment in this industry comes from institutional investors. In the renewables sector, there is a Government investment because they it gets more money for its electricity.

[89] **Llyr Huws Gruffydd:** Nid wyf yn sôn am lefel y buddsoddiad. Rwy'n sôn am lefel yr allyriadau. Os ydym yn mynd i fod yn buddsoddi mwy mewn tanwydd ffosil, bydd mwy o allyriadau a byddwn yn symud i'r cyfeiriad anghywir pan mae'n dod i gwrdd â rhai o'n rhwymedigaethau rhyngwladol.

**Llyr Huws Gruffydd:** I am not talking about level of investment, but the level of emissions. If we are to be investing more in fossil fuels, then there will be greater emissions and we will be moving in the wrong direction when it comes to meeting some of our international obligations.

[90] **Mr Williams:** That has been broadly stated, but it has been proved to be incorrect. I have the emission figures on the pick-up points. Please bear with me; I did not know in what order the questions were coming.

[91] **Lord Elis-Thomas:** If there is any additional material, we would be very glad to receive it.

[92] **Mr Williams:** I have a PowerPoint presentation to show you.

[93] **Lord Elis-Thomas:** We will have that as well.

[94] **Mr Williams:** It is easier for me with pictures. On air pollution, a recent survey monitored the air emissions of a drilling rig and found them elevated. However, the air pollution around a typical pick-up and drop-off point—that is, people taking the kids to school or to a day centre and picking them up at the end of the day—were found to be 200 times higher. Evidence from the Pennsylvania Department of Environment Protection shows that

[95] 'emissions from drilling represent a small fraction of air pollution in the state, which has gone down considerably since shale gas development began in earnest several years ago'.

[96] So, there is proof there that it is not going to go up; it is going to go down.

[97] **Llyr Huws Gruffydd:** Mae hynny'n cynnwys y drilio yn unig. Mae ffactorau eraill; bydd eisiau trafniadaeth i drosglwyddo'r *syngas*, er enghraifft. Beth am y darlun ehangach?

**Llyr Huws Gruffydd:** That only includes the drilling. There are other factors; there will need to be transport to carry the syngas, for example. What about the bigger picture?

[98] **Mr Williams:** In parallel to all this, as you said earlier, we are closing oil and coal stations. That is the bigger picture. We are trying to get emissions down in the UK, so they will drop. Gas generating stations have approximately 50% of the emissions of coal stations. So, just swapping over to gas in the bridging period will result in a drop in emissions. I cannot give you any accurate figures on that this morning, but I can get them for you.

[99] **Llyr Huws Gruffydd:** Dywedoch yn gynharach fod nwy siâl yn lanach na glo, a bod hynny wedi arwain at losgi llai o lo yn yr Unol Daleithiau. Fodd bynnag, y tebygolrwydd yw bod y glo hwnnw yn dal yn cael ei losgi, ond ei fod yn cael ei losgi yn

**Llyr Huws Gruffydd:** You said earlier that shale gas is cleaner than coal, and that it has led to a reduction in the burning of coal in the United States. However, the likelihood is that that coal is still being burnt, but that it is being burnt elsewhere. I am trying to look at

rhywle arall. Rwy'n edrych ar y darlun o the picture in terms of emissions.  
safbwynt yr allyriadau.

[100] **Mr Williams:** You are looking at the worldwide picture, and I am looking at the UK picture. China opens a new coal station every couple of weeks. All we can be concerned about is Wales and then the UK.

[101] **Llyr Huws Gruffydd:** Mae'r ddau ohonom yn cytuno ar hynny yn sicr. **Llyr Huws Gruffydd:** We are both agreed on that point, certainly.

[102] O ran y pris, rwy'n credu y bu i chi awgrymu yn gynharach y byddai hynny'n gyrru prisiau i lawr. Pa dystiolaeth sydd gyda chi o hynny? Cyflwynwyd tystiolaeth sy'n dadlau na fyddai hynny'n digwydd mewn gwirionedd? On the issue of cost, you suggested earlier that it would drive prices down. What evidence do you have of that? Evidence has been submitted that argues that that would not be the case?

[103] **Mr Williams:** We have drilled six holes, and we know what the drilling costs are. We know what the production of a well is, and, therefore, we know what the payback time of a shale gas well would be. A typical well pad has been built in Arlington in Texas, alongside the University of Texas. It has 23 directional wells off one pad of about 2 acres, and we estimate it cost about \$121 million to drill and develop. Only about half of those wells would be working at any one time, so about 10 working wells would produce about 50 million to 80 million cu ft of gas a day, which is a lot of gas. You need 200,000 cu ft, roughly, to generate one megawatt of electricity. So, you have 5 MW for every 1 million, and for 80 million, you are talking about something like 400 MW of electricity.

[104] **Llyr Huws Gruffydd:** Ie, ond o ran impact ecsbloetio nwy anghonfensiynol yng Nghymru ar filiau cwsmeriaid yng Nghymru, pa impact y byddech chi'n ei weld yn y cyd-destun hwnnw? **Llyr Huws Gruffydd:** Yes, but in terms of the impact of exploiting unconventional gas in Wales and the impact of that on customer bills in Wales, what impact would you anticipate in that regard?

[105] **Mr Williams:** I think that the price of gas would go down. It will go down in the same way as it has in America.

[106] **Llyr Huws Gruffydd:** A ydych chi'n cydnabod y byddai costau alldynnu'r nwy hwnnw yn uwch ym Mhrydain nag ydyw yn yr Unol Daleithiau? **Llyr Huws Gruffydd:** Do you recognise that the cost of the extraction of that gas would be higher here than it is in the United States?

[107] **Mr Williams:** I hear people say that all the time, but my answer is, 'No, I don't think that it would be higher'. If we manage this properly, and manufacture the right equipment to do the job properly, we can contain the cost.

[108] **Keith Davies:** Byddaf yn gofyn fy nghwestiwn yn Gymraeg hefyd. **Keith Davies:** I will ask my question in Welsh too.

[109] Yn yr ateb y rhoddoch chi i Vaughan Gething yn gynharach, roedd sôn am ffracio a methan gwely glo. Dyna yw fy niddordeb i. Mae gan Russell George ddiddordeb mewn ynni gwynt, ac mae gennyf i ddiddordeb yn yr ynni sy'n dod o'r glo. Felly, a oes ffracio o gwbl wrth fynd ar ôl methan gwely glo? In the answer you gave to Vaughan Gething earlier, you talked of fracking and coal-bed methane. That is my interest. Russell George is interested in wind energy, and I am interested in the energy that comes from coal. Is there any fracking at all when you go after the coal-bed methane?

[110] **Mr Williams:** It depends on where you are in the coalfield. If you are at the top north-west corner of the Ammanford area, you are in the anthracite field.

[111] **Keith Davies:** Roeddwn i'n bwriadu **Keith Davies:** I was going to ask you about eich holi chi am lo carreg, oherwydd dyna anthracite, because that is what is in my area. sydd yn fy ardal i.

[112] **Mr Williams:** Anthracite has about 33 cu m per tonne of gas. If you come right down through to the bituminous coal, it has about 5 cu m of gas. The volatile matter in the anthracite is about 6%, while it is 30% plus in the bituminous matter. The volatile matter is a guide to the permeability. So, good anthracite, such as Cynheidre's, is like a piece of glass.

[113] **Keith Davies:** Nid ydych chi wedi **Keith Davies:** You have not named one area enwi un ardal yn y gorllewin sydd â in west Wales that has a licence with your thrwydded gyda'ch cwmni. company.

[114] **Mr Williams:** No, because of the fact that we cannot get the gas out of the anthracite. When we worked in Cynheidre, it was subject to outbursts of methane, and that was because the coal is so tight and the permeability so low that, when it was mined, it would crack and you would get contained pockets of gas bursting out. They have tried and tried in China to get gas out of anthracite. If we could get 33 cu m per tonne, we would be laughing. [*Laughter.*] However, at the moment we cannot, so we are sticking. We can draw two lines on an x-y graph. Where the permeability is right and where the cubic metres per tonne of gas is right, that is what you have to concentrate on, because that has the best bet of working—and that line is running through Margam and Maesteg, and over to Swansea. That is the best area in which to start. Volatile matter, if you take the square that I have drawn here as a coalfield, increases in arcs, coming down from the north-west to the south-east.

[115] **Keith Davies:** Beth am y ffracio? **Keith Davies:** What about fracking?

[116] **Mr Williams:** Coal-bed methane wells have been fracked, but we would concentrate more on directional drilling, whereby you drill a high-angle or vertical well and pick the seams. In Llangeinor, we are using a 3.5m thick seam, so we drill out. We have 28 ft thick seams in parts of south Wales.

[117] **Keith Davies:** Pan oeddwn yn **Keith Davies:** When I was a boy, I would go fachgen, roeddwn i'n mynd i'r gwaith glo a the coal mines and went underground, and mynd dan ddaear, ac yno roedd troedfedd neu there was a foot or two in the anthracite ddwy yn ardal y glo carreg. areas.

[118] **Mr Williams:** Yes, we have worked in those as well and they are still being worked in some private mines. You drill directionally in the seam and, the further you drill, if you pick a piece of coal up, it will be cleated—it is friable coal. You drill at 90 degrees to those cleats. So, once you drop pressure around the well, the gas will naturally start to flow through the cleats back into the well, and it does not need fracking.

[119] **Keith Davies:** Yn gynharach, wrth **Keith Davies:** Earlier, in talking about shale sôn am nwy siâl, roeddech am sôn am gas, you spoke about trillions and so on. So, *trillions* a phethau. Felly, er mwyn cymharu, in order to compare, how much is there in the faint sydd yn y glo o hyd yn ne Cymru? coal in south Wales? You say that there is no Rydych yn dweud nad oes ffracio, ac efallai y fracking, and perhaps people would accept byddai pobl yn derbyn hynny'n fwy naturiol. that more naturally. So, how much gas is Felly, faint o nwy sydd yno? there?

[120] **Mr Williams:** RISC in Perth, in Australia, came up with two, roughly. With coal-bed methane, the gas initially in place is 1.65 trillion cu ft. That is about a six-month supply, if you could get it all out, for the whole of the UK. It is still a big figure. Big companies develop gas fields of a couple of billion cubic feet, so 1,650 billion cu ft is a lot of gas.

[121] **Antoinette Sandbach:** I want to go back to the comments that you made about the representations that you have been making about tax returns coming back to the local area. How do you see that working?

[122] **Mr Williams:** I will wait to see what the nuclear paper says; that should be out in the next few days. There are two elements to that, as far as we are concerned, in relation to the Treasury. To make it work, we think that it should have some tax breaks for investors. In the US, in coal-bed methane in the 1990s, there was a section 29 tax break, so that people who invested in the unconventional gas industry got some tax relief on other earnings that they made. That is what helped it to take off so quickly. Where we pay business rates, for example, on a generating site—say they were £50,000 a year—at the moment that goes into central Government and that is the end of it. We are saying that that money ought to go straight back to the local authorities or to central Government here in Wales, and the places where the gas is being exploited should see the benefits.

[123] **Antoinette Sandbach:** Therefore, would you like a tax break from central Government for investment without paying that back through any other kind of return?

[124] **Mr Williams:** It is not necessarily us—it is the initial investor who will get an initial tax break, we would think. I believe that there will be announcement in the budget relating to something along those lines. We are more interested in seeing the money that is earned in this industry coming back to the areas where it is earned.

10.30 a.m.

[125] **Antoinette Sandbach:** So, are you proposing some form of community return package in the same way that, for example, the local development companies offer some sort of community return package to communities that have windfarms?

[126] **Mr Williams:** No, it has to be far more organised than that and not left to the companies. It has to be Government-initiated with proper flow lines of money. Money that is earned here is taxed; it goes to either the Welsh Government or central Government and then it is distributed pro rata. Our association has spent months on this, to be honest, and it has sent a very comprehensive paper to the Treasury. I do not know whether I can give you that paper, but I will try. If I can get that paper and the letter that has gone to the Treasury, I will let you have it.

[127] **Antoinette Sandbach:** That would be very helpful. I now want to return to the meeting that you had with Peter James.

[128] **Mr Williams:** I have not had the meeting yet.

[129] **Antoinette Sandbach:** Oh, you have not had it.

[130] **Mr Williams:** No. I spoke to him yesterday. His wife has had an accident, so he could not meet up.

[131] **Antoinette Sandbach:** Right. So, there is some sort of pollution of water that takes place, and that water needs to be treated.



[132] **Mr Williams:** I would not say that it is pollution. There are chemicals that we would want to take out of it before discharging it back into the water course.

[133] **Antoinette Sandbach:** We have evidence from Friends of the Earth that there are 253 chemicals known to be used in fracking in the US system, that around a quarter of these could cause cancer, and that 40% to 50% could affect the nervous and immune systems.

[134] **Mr Williams:** That is absolutely right, but we are not in the US; we are in the UK.

[135] **Antoinette Sandbach:** So, you are saying that you will not use any of those chemicals, are you?

[136] **Mr Williams:** We will use the chemicals that are approved by the Environment Agency.

[137] **Antoinette Sandbach:** Do any of those chemicals have known side-effects, and, if they are hazardous in some sort of way, how are you proposing that that will be treated?

[138] **Mr Williams:** They are not hazardous, because they can be used in the food industry. With respect, if you read the Government report, some of the world's best scientists have been brought together by the UK Government to find a way to get out of the problems that you are presenting.

[139] **Antoinette Sandbach:** Well, for example, the reason why we do not have 'bute' in the human food chain is because, in higher quantities, it can cause real damage to human health. However, in small quantities it cannot. It is not just about whether or not an individual chemical can cause problems; it is about the quantities in which they are used.

[140] **Mr Williams:** That is absolutely right, but, if you take 18,000 cu m of water, only 0.4% is of chemical make-up. That is absolutely minimal and we are saying that that will be taken back out in any case. By the time that we frack this in Wales—I am not going to stick my neck out on this, to be quite honest; in terms of fracking, we will let the big companies do it first—it will be proven that it is safe practically as well as theoretically.

[141] **Antoinette Sandbach:** So, you are accepting at the moment that it is unproven and that you need to wait for that—.

[142] **Mr Williams:** No, I am not accepting. People think, 'We are now going to frack in the UK. This is new. We are going to have major problems'. The first well in the UK was fracked 60 years ago. We have been fracking onshore in this country for 60 years and we have not had a problem.

[143] **Antoinette Sandbach:** I disagree with that. I think that there were problems. There were certainly seismic problems—in England, more than in Wales necessarily.

[144] **Mr Williams:** Let me address that. I am trying to look for two sheets of Nick Riley's paper.

[145] **Lord Elis-Thomas:** Since the seismic question has been raised, I think that I should give you an opportunity to respond to that.

[146] **Mr Williams:** I will, and I will go back to Mr Gething's question. The British Geological Survey monitored the seismic activity around the St Helens area and used what is called the European macro-seismic scale. It recorded on 27 May, during the shale gas drilling operations at Preese Hall by Cuadrilla, a magnitude of 1.5. That was not on the Richter scale,

but on the EMS. On the EMS, 1 means ‘not felt’, even under the most favourable conditions, and 2 means ‘scarcely felt’—that is vibration that is felt only by individual people at rest in houses, particularly on upper floors of buildings. So, that was the scale of that. It is less than a train going past. It was not huge. It was painted to be massive and a big problem, but, in reality, that is absolute information from the BGS. That is the scale of it. I hope that that answers your question as well, Mr Gething. I did not come back to you on that, I am sorry.

[147] **Lord Elis-Thomas:** I will call Vaughan, Llyr, David, William and then that is it, I think.

[148] **Vaughan Gething:** All that I was going to say, Chair, was that I think there is more to go on the issues around fracking, and I will be interested in evidence around this from other people as well. I have heard very clearly the points that have been made, and I would be very interested in hearing what natural resources Wales has to say to us, when we get to talk to it, about these particular points. I understand perfectly what you are saying, and it is very interesting, and I am sure that we will continue to consider it.

[149] **Llyr Huws Gruffydd:** Rydych wedi peintio darlun delfrydol iawn, os caf i ddweud, o’r diwydiant a’r potensial, ac wrth gwrs ni fyddwn yn disgwyl dim llai. Fodd bynnag, yn eich barn chi, ar ôl sôn am yr holl fanteision a’r holl gyfleoedd, beth ydych yn meddwl yw gwendid mwyaf y dechnoleg hon?

**Llyr Huws Gruffydd:** You have painted a very idealistic picture, if I may say so, and of course I would not expect anything less. However, in your opinion, having mentioned all the advantages and opportunities, what do you think is the biggest weakness of this technology?

[150] **Mr Williams:** Let me look at the conclusions. The weakness in the whole system at the moment is that there is no service industry at all. We have these people in Newport, but we do not know what they can do yet, until we meet them. They have told us what they can do. We know that we have a consultancy in GreyStar in Resolven, and we know that we have SLR Consulting down here in the bay, which can provide all the environmental consultancy that we want, from particulates in the air to noise to ecology and everything else. There are no mid-size drilling rigs in the UK. There are small water-well rigs and small coring rigs, or there are big land rigs, like oil rigs. There is a need for drilling rigs. Apart from one set with Cuadrilla, there is no fracking equipment in the UK. There is a big gap there. Until we get all of this equipment together, it will not take off. It will be slow. That, as I see it, is the weakness. I do not see any weaknesses in terms of safety or production costs, but I see weaknesses in terms of provision of materials and equipment.

[151] **David Rees:** May I just clarify a couple of points? On the issue of the 0.4% chemicals input, has there been any scientific study to see whether those chemicals break down and merge with other products under high pressure?

[152] **Mr Williams:** Absolutely. That is what the working party that the Government set up did, and I can get you that paper.

[153] **David Rees:** That would be very interesting. Thank you for that. You mentioned that the coal-bed methane drilling would not be used for fracking. Does that mean that you would do different wells for fracking compared with those for the extraction of coal-bed methane?

[154] **Mr Williams:** They are different, yes. You will drill directional wells for shale gas, and you frack along the directional part of the well, but they are different types of well, really. The coal-bed methane wells will go down and maybe have directionals in four or five different seams off the vertical.

[155] **David Rees:** Will you use those wells once the coal-bed methane has been extracted for continuing exploration for shale gas?

[156] **Mr Williams:** No. We would use exploration wells for pilot production wells. We would start at the other end of the scale and, at the moment, we have not wasted our money because we have a lot of information. You drill a core hole and you fill it up with cement and that is the end of it. You have spent hundreds of thousands of pounds drilling a hole and we should be able to reuse that hole for something else later. That is what we are working on at the moment.

[157] **David Rees:** Can you also tell me about the spread? Obviously, you go down, and you said that you go out. What is the average spread that you would expect?

[158] **Mr Williams:** On that shale gas part, it is up to a mile. The biggest one is Wytch Farm, which is offshore, and that is something like 11 km. For a coal-bed methane well, we would start off with 100m or 200m, and we would go out to probably a maximum of 1,000m.

[159] **David Rees:** You mentioned a BGS report that referred to the issues in the Blackpool area, but have you had any analysis of the faults within the Welsh area, and the impact this might have on faults within Wales? Would there be a similar issue?

[160] **Mr Williams:** Yes, we have spent nearly two years making a very detailed 3D model. We have put 4,500 data points into it and from that we can get down to micro-pictures of individual faults and mine workings. We have put a mass of work into it, and we probably have more information than anyone else in the industry.

[161] **David Rees:** The final point on that is this: from what I see, Cuadrilla is drilling in more of an open area. Most US fracking areas are open areas. In south Wales, we are talking about valley areas, mountainous areas and tighter communities.

[162] **Mr Williams:** Well, the big part I talked about is right in the middle of Arlington. I will send you the slide. It is right in the middle of the town. South Wales is nearly all plateau incised by glacial valleys, and the mines were developed at the base of the valleys, partly because they did not have to sink so much shaft, and partly because it was probably much more comfortable to live there, but, because of that, when we get up into the forestry with its own road network, okay, we have to drill that extra distance to the valley depth, but we can be up there and out of anybody's way. It is a big, big area, all in Welsh Government ownership, and it is ideal for drilling.

[163] **David Rees:** St John's is not in a forestry area, is it?

[164] **Mr Williams:** St John's is not. The only reason why we drilled there is that it is remote and we own the land up there. It is 65 acres of land that we own, and it is much easier to do things on our own land first.

[165] **David Rees:** The Cornell University research indicates that there is an impact from drilling on health risks. It did not state whether it was on residents or workers, but there is an impact on health risks from drilling. In a valley area, does that tend to be held down a bit more?

[166] **Mr Williams:** We prefer to drill out of the valley. We would rather take the cost and drill elsewhere. When we go up into the forestry, apart from us going through the gate at the beginning of the shift, nobody knows we are there, really.

[167] **David Rees:** I think that the biggest concern for us is the fracking side of things. That

is the big issue. I was pleased to hear you say that you would not even think about it until it is more proven. That is an interesting point. I think that we will wait for some of the evidence that is yet to come, particularly with regard to Europe. That is an issue as well. The European Commission is looking at this very carefully. Do you have any input into that process? Are there organisations in Europe that you would discuss this with?

[168] **Mr Williams:** We have the UK Onshore Operators Group, which I am quite active in. We sit on a few working parties there. The chief executive of the group, Ken Cronin, was down with us last Friday. There was an Energy Institute memorial lecture in the Angel Hotel given by Nick Riley of the British Geological Survey. So, we are talking to BGS and to others in our organisation, and Ken Cronin will be talking to central Government and European government.

[169] **David Rees:** How many members are there in that organisation, out of curiosity?

[170] **Mr Williams:** They range from BP down to smaller people than us. I think that there are 20-odd at the moment, including Cuadrilla and IGas Energy.

[171] **William Powell:** You are probably aware that quite a substantial petition was received by the National Assembly from a group of people who are very concerned indeed about the potential implications of fracking. It is clear from your very candid evidence that fracking here in Wales is in its pre-infancy in many ways. What engagement and contact have you had with colleagues in the United States of America? You referred to the fact that there is an inadequate level of regulation and policing, and that the whole framework has not been appropriate, with some serious public relations disasters and even environmental disasters in recent years, in Ohio, New York State and elsewhere. What contact have you had with colleagues in the United States, and what feedback would you give to the UK Government, the Welsh Government and to the environment directorate in the European Commission on the safeguards that you would like to see to protect the environment and public safety if this technology is to be successfully developed?

[172] **Mr Williams:** All of that is best handled in an organised manner, and that is through the UK Onshore Operators Group. We have set up different working parties and we put our papers to the Environment Agency or to the BGS—we get input from them as well. I think that it is UKOOG that should be presenting it. For instance, we have—again, I can send you this—the declaration on fracking fluids to be used. All those have to be approved, as we were saying—not that we will be using them for a while, mind. The path is that each individual company presents to a working party, working parties present to the council of UKOOG, and the council of UKOOG presents to central and Welsh Governments. In that way, there are no bits being missed, because it is all handled by a central point.

10.45 a.m.

[173] **David Rees:** Is it your view that, at present, once you have extracted coal-bed methane operations, you would, under the current situation, move ahead with fracking?

[174] **Mr Williams:** No. We drill the shales and analyse them. We need to drill the Namurian, Silurian and Ordovician shales, all of which I have mentioned, which will take us a good couple of years. In parallel with that, Cuadrilla and IGas Energy will be carrying on with their work, so it is not going to hold us up at all. The good side is that they will be breaking the ice.

[175] **David Rees:** If nothing changes, therefore, you will consider fracking.

[176] **Mr Williams:** Yes. We will have to in order to get the gas out.

[177] **Lord Elis-Thomas:** To sum up, what you are telling us is that you hope to continue with your activity in relation to the coal-bed methane with the horizontal drillings that you describe. In the meantime, you are conducting exploratory drilling in relation to the potential of shale gas. That is your company policy, and that is your intention.

[178] **Mr Williams:** That is right.

[179] **Lord Elis-Thomas:** Thank you very much.

[180] **Mr Williams:** We will send you more information, Chairman.

*Gohiriwyd y cyfarfod rhwng 10.46 a.m. a 10.56 a.m.  
The meeting adjourned between 10.46 a.m. and 10.56 a.m.*

**Nwy Siâl a Nweyddio—Tystiolaeth gan UCG Association a Clean Coal Limited  
Shale Gas and Gasification—Evidence from UCG Association and Clean Coal  
Limited**

[181] **Yr Arglwydd Elis-Thomas: Lord Elis-Thomas:** I welcome Dr Shaun Estynaf groeso i Dr Shaun Lavis o Clean Lavis from Clean Coal Limited. Coal Cyfyngedig.

[182] This evidence session is part of a broader session that we are undertaking on the whole aspect of unconventional, or less conventional, gas. I thought perhaps you could describe for us what the company for whom you undertake geological work actually does and the current state of the development of your projects, particularly as they apply in Wales. We are particularly interested in the Seren project at Cardiff University, obviously.

[183] **Dr Lavis:** I will first pass on the apologies of my colleague, Julie Lauder, who is unable to make it today; she is very disappointed that she could not be here. My company has worked with the UCG Association, so I will be able to answer some questions on that. In terms of Clean Coal Ltd, we are a company specialising in UCG. We are a small company with five UK licences around the UK near-shore environment, and a number of projects in various stages of development around the world. In the UK, our projects are all in the early stages, so we have completed preliminary geological assessments of the available geology, hydrogeology and other information, and we are looking into the business opportunities at each of these sites, essentially because syngas is not like natural gas and it cannot be put straight into a pipeline. The natural gas, with minimum treatment, is put into a pipeline, so we need to identify very specific business opportunities at each of these places.

[184] What we are looking for is three main aspects. We are looking for economic projects, a geological setting that minimises environmental risks, both on the sub-surface and on the surface, and we are also looking for what we call a carbon dioxide solution, namely some way in which we can capture the carbon dioxide and do something useful with it, be that a use in something like EOR or enhanced CBM or sequestration. Obviously, we will touch on that later.

[185] **Lord Elis-Thomas:** Perhaps you would like to expand your acronyms for the purposes of the record and for members of the public, who may or may not be following this.

[186] **Dr Lavis:** Absolutely. EOR is enhanced oil recovery, where you can inject carbon dioxide into a declining oil field, which stimulates more oil production. ECBM is enhanced coal-bed methane. Mr Williams talked just now about CBM and about injecting carbon

dioxide into the coal, because coal has a much greater affinity for carbon dioxide than methane, so the carbon dioxide adheres to the coal and displaces methane and you get great production from that. So, those are the two acronyms that I think I have mentioned so far.

11.00 a.m.

[187] **Lord Elis-Thomas:** Did you not use UCG?

[188] **Dr Lavis:** Yes; UCG is underground coal gasification.

[189] **Lord Elis-Thomas:** UCG is the University College Galway to me. We have to be careful about what our acronyms mean. We now have all those for the record. David, do you want to lead on this?

[190] **David Rees:** Yes, I do not mind leading on this. I suppose that we have heard the question about the safety issues of shale gas fracking. What kind of research has been done on the safety issues of underground coal gasification, because you are talking about burning coal underground and the implications of that on various aspects? So, what studies have been done on that?

[191] **Dr Lavis:** Is everyone happy with UCG—underground coal gasification—and what it actually is?

[192] **Lord Elis-Thomas:** Yes, I think that you should explain that it is not University College Galway and I will stop making my silly joke. [*Laughter.*]

[193] **Dr Lavis:** UCG is not a new technology; there have been around 100 tests or so over the last century. The main, modern place where tests have taken place is the US, and 30 trials were undertaken there by research organisations such as the Lawrence Livermore National Laboratory. Those were well-funded pilot projects that used a lot of cutting-edge monitoring technologies. They monitored groundwater compositions and deformation in the sub-surface with very dense monitoring networks, so they knew what was going on in and around the reactors. That information has been published, so we have a very good understanding of what the environmental risks of UCG are.

[194] Perhaps the first risk is subsidence, which is probably one of the best understood environmental risks, simply because it is very similar to what you would expect in a coal mine. You are physically excavating a cavity in the sub-surface, which means that the overlying rocks are no longer supported and they start to deform and you have a propagation of that deformation for a certain distance above the cavity.

[195] UCG is comparable to mining, but you should not think of the result of UCG as empty cavities, because the cavities are filled with ash. Much of the ash from the coal stays in place, along with spalled rock and char, which is thermally affected coal that occupies that space. So, the amount of deformation caused by UCG is probably less than that of mining. It can be managed using exactly the same techniques as mining, such as the room-and-pillar method, where coal is left in pillars or in between mining cavities to support the overburden and minimise deformation. So, basically, what has come out of the, for example, Lawrence Livermore trials are very sophisticated models that have taken existing subsidence models from mines and adapted them to UCG in integrated computer codes to predict the amount of subsidence that you would expect above UCG modules. A module is a linked production and injection well.

[196] **David Rees:** Did you say that you can specify which areas you can burn and that you can leave some alone?

[197] **Dr Lavis:** Absolutely.

[198] **David Rees:** So, it is that specific.

[199] **Dr Lavis:** Yes. The geometry of the cavity that you get from gasification is very well understood. Essentially, and I do not know if you have seen the diagram in my paper, but you get this very distinctive teardrop shape, and that has been proven experimentally and in trials. So, the geometry of that cavity is very well understood and we know how things like pressure and depth and the type of coal affect the geometry of that cavity. So, now that we know the geometry of that cavity, we can control its position, using what we call 'the controlled retracting injection point' or CRIP. We can control, to within a few centimetres, the injection point within the coal where gasification will take place. So, we can control the point at which gasification takes place and we know the geometry of the UCG reactor, so we can plan multiple modules, separated at a certain distance, to make sure that the cavities are not communicating with adjacent modules.

[200] **David Rees:** So, you can ensure that it is managed effectively and that it does not impact on other mechanisms or on mining coal-bed methane and so on.

[201] **Dr Lavis:** Absolutely. Part of the site-selection process for UCG happens right from the very start, to ensure that we are nowhere near any existing or abandoned mines. The way that licences work in the UK, you cannot get a petroleum exploration and development licence to do CBM on UCG licences. It is exclusively UCG.

[202] **David Rees:** Is there are a required link for carbon capture and storage mechanisms with gasification? What are the implications?

[203] **Dr Lavis:** According to the regulations, carbon capture and storage come into effect if you are generating electricity over 50 MW, I think. I am not exactly sure, but it is not an awful lot.

[204] **Lord Elis-Thomas:** You will find that everything in this field is over 50 MW.

[205] **Dr Lavis:** It is a cut-off, as is 99% capture. So, in that respect, it does. If we use syngas for something else, such as generating diesel or fertilisers, then those regulations do not apply. As a responsible company, with a reputation that is out there for people to see, we would not want to be generating diesel while emitting carbon dioxide as a by-product of that process. We could not look in the mirror and call ourselves clean. I do not think that it would be accepted by the public.

[206] **David Rees:** There is a difference between responsible companies and having statutory obligations.

[207] **Dr Lavis:** Absolutely. That is why I made that point. Reading the regulations exactly how they are written, they would allow us to vent carbon dioxide if we were to produce diesel from our syngas. However, that is not something that we would want to do as a company.

[208] **David Rees:** A less responsible company could do that at present.

[209] **Dr Lavis:** Yes, according to my reading of the regulations.

[210] **David Rees:** I have one final point. What potential capacity do we have available for this approach?

[211] **Dr Lavis:** It is difficult to estimate. Some work was done at Cardiff before the Seren project, looking into the UCG potential of Wales. It identified—I do not know the number off the top of my head, but it was presented at a conference—several million tonnes of coal suitable for UCG. As I said earlier, the most important thing is site selection. That is like a first pass: identifying priority areas that may be suitable for UCG. However, more information is needed.

[212] **David Rees:** You have licences for two in south Wales—

[213] **Dr Lavis:** We have one. Cluff Natural Resources Plc has the other licence. For example, in Swansea bay—we do not know because we have not been out there and drilled it—if you make a rough estimate based on the area, the multiple occurrence of coal seams and some estimates on coal seam thickness, there is probably billions of tonnes of coal. However, we would not be looking to exploit anything like that much coal. We are looking at much more focused projects that may need 30 million tonnes in total. So, in that respect, we are not resource constrained in Swansea bay.

[214] **Vaughan Gething:** I want to go back to the groundwater issues that were raised with the first set of witnesses from UK Onshore Gas. I note that the paper produced by Clean Coal Ltd says that there is no groundwater risk. I think that you said something slightly different about the level of risk. However, the paper says that

[215] ‘three pilot projects have been operating in heavily regulated regimes for years with no indications of causing groundwater impacts’.

[216] I am interested in where they are and where the evidence is that there are no impacts. I know that the House of Commons Energy and Climate Change Committee has taken an interest in this. I want to know where that evidence is and how certain we can be that there are minimal risks to this area. Of course, I would expect Clean Coal Ltd to say that there were limited risks.

[217] **Dr Lavis:** Absolutely. First, apologies for that paper; it was my understanding that it was supposed to be very short and non-technical. It was at short notice; I would like to have provided more information than I did.

[218] **Lord Elis-Thomas:** Do not worry; we are in the business to receive more. *[Laughter.]*

[219] **Dr Lavis:** It is less reading for you.

[220] There are three licensed projects. The first is in Alberta, and it is called the Swan Hills project. It is regulated there by the Energy Resources Conservation Board. It is a modern regulatory system. They are used to coal-bed methane, they have been injecting sulphur gases into the sub-surface and they have oil sands there. So, they understand all of the processes well, and they have great experience of regulating those activities. The other two projects are in Queensland in Australia. One is called the Chinchilla project and has been operating for about a decade or so. The other is Carbon Energy, which has been operating for about half of that time. So, as part of their permits to operate in those places, they need to take things such as regular groundwater samples for independent analysis, looking for compounds such as benzene, different kinds of phenols and all those typical groundwater contaminants that are associated with coal tars. Obviously, if they detect a concentration of one of those compounds above a threshold, which could be drink-water standard, that would be a significant occurrence, and it could result in those projects being shut down quickly. However, that has not occurred.



[221] **Vaughan Gething:** Is it that the technology is safe, or, if you are to go ahead with this, that a strict regime of regulation is needed?

[222] **Dr Lavis:** Yes. The technology has inherent risks, and if it is done on a site that is not suitable, you will put the environment at risk. So, the absolute importance is site selection. The environmental regulations are there to protect the environment, and if we want a project there, we need to meet those specifications or the conditions of those regulations.

[223] **Vaughan Gething:** I asked a question to natural resources Wales about whether the current regulatory regime provides enough safeguards and conditions to ensure that the level of protection that appears to have taken place in Canada and Australia would be replicated here if there was a commercial project.

[224] **Dr Lavis:** We worked with the Underground Coal Gasification Association in meeting organisations such as the Environment Agency and the Health and Safety Executive, and we worked with them in order to develop the current list of guidelines that are available on the Environment Agency website now. So, if you have a look at those on the website—and I have a copy of it here—you will see that there are a fair few pages about the different instruments and regulations in place. What would have to be done to meet them is not noted, but the regulations are there.

[225] **Vaughan Gething:** The other thing I am interested in is the use of carbon dioxide. You said that you could already use things for established technologies in enhanced or recovery contexts. The other point was about coal-bed methane extraction to assist in that. The paper talks about reinjecting carbon dioxide into spent cavities. In the three areas that you pointed to—in Alberta and the two in Queensland—does that take place and is it shown to work, in terms of capturing and retaining the carbon dioxide? If you could answer that first, I will then come on to a second point.

[226] **Dr Lavis:** There is one project, from the very start, which was linked to carbon capture and reuse, and that is the Swan Hills project, where the carbon will be reused for enhanced oil recovery. The other two are doing research into carbon capture and possible storage on site; I believe that at least one of them is. However, to date, that has not been achieved. Can you remind me of the rest of the question?

[227] **Vaughan Gething:** My question was about what they are doing. The paper talks about reinjecting into spent coal gasification cavities.

[228] **Dr Lavis:** Yes. That is a promising area of research. It is not something that will happen any time soon, in my opinion. What is more likely is the carbon capture and reinjection into saline aquifers, following a standard carbon capture and storage model.

11.15 a.m.

[229] **Vaughan Gething:** That is one of the concerns that I am sure we all have: where we are with carbon capture and storage and how commercially viable it is. If we are going to write a report that says that you should get on with more underground coal gasification and these projects, if there is not the capacity to capture and store the carbon, we just seem to be adding to a risk that we already know about. I am interested in whether it is commercially viable. We are often told that there is not a commercially viable way of undertaking carbon capture and storage, so I am interested in how far you are from this being promising research. The paper does not say that reinjecting into spent UCG cavities is promising research; it says that carbon dioxide can then be used. I heard what you said about enhanced oil recovery being there already and about coal-bed methane use, but if we are talking about other speculative areas, that is going to have an impact on how ready we are to say that there should or should

not be more underground coal gasification in Wales.

[230] **Dr Lavis:** Absolutely. The carbon capture and storage issue is significant for the project development, as I stated at the start. It is one of the things that we are looking for as a solution if we are going to go ahead with a project. Can you remind me about the main point that you want me to address?

[231] **Vaughan Gething:** I am interested in how far away you think we are from having commercially viable carbon capture and storage, and particularly how it relates the underground coal gasification, because I appreciate that it is the ideal utopia for many other forms of energy generation.

[232] **Dr Lavis:** It is hard to say. When I started in UCG, there was talk of CCS projects, of Government sponsorship for projects around the UK and of that happening very quickly. That seems to have dropped away. It is difficult to say when there will be a commercial CCS project in the UK. That presents a lot of troubles. It is not really a case of capacity; it is a case of getting the projects to go ahead and to be economic. In that respect, that is where I think UCG can contribute. We can produce syngas at a low cost and there are advantages for carbon capture in that syngas production because the carbon—the carbon dioxide or syngas—comes out at a high temperature and pressure. That means that you do not need to pressurise the carbon dioxide prior to putting it in conventional capture systems. Therefore, as regards carbon capture, UCG can offer cost benefits. There is work going on in the UK to try to get a demonstration project for a combined underground coal gasification and carbon capture project. That is where I believe UCG can contribute to CCS—by producing low-cost syngas and carbon capture.

[233] **Vaughan Gething:** Finally, I want to refer to two things. You may have heard Gerwyn Williams talking about the use of carbon dioxide, saying that once you have captured the carbon, you can spin it and make carbon fibre things out of it, so this will all be sorted. That is paraphrasing a bit and I am not trying to say that that is exactly what he said, but he was saying that there is a use for this and that it is all possible. Do you have a view on how likely that is? I am sure that we will ask other people the same sort of questions. I am also interested in having a bit more information about the Seren project with Cardiff University.

[234] **Dr Lavis:** I will not be able say a lot about Seren but I will do my best, and I can provide you with the names of people whom you can contact. The use of carbon dioxide is part of the solution. It is about balance: are you going to be able to use as much carbon dioxide as you are producing? Perhaps producing things like carbon nanotubes alone is not going to help that. Enhanced oil recovery, enhanced coal-bed methane and other uses such as the production of dimethyl ether and other chemicals—

[235] **Vaughan Gething:** Sorry, what is dimethyl ether?

[236] **Dr Lavis:** It is a kind of petroleum—it is a liquid that you can use to drive engines and produce electricity. These can offer offsets for the amount of carbon that you will produce, but I think that really, CCS is the one that will solve the problem. In the meantime, you can reduce the amount of excess carbon dioxide by using, for example, enhanced coal-bed methane recovery or enhanced oil recovery.

[237] **Vaughan Gething:** What sort of portion are we talking about using—capturing 5% of carbon dioxide or more than that? Part of the problem is that these all sound interesting and attractive, but if you are really saying that you can use an element of it already, but that you are still left with 95% of what you have produced, that is still a problem for us. If we are still 20 years away from building planes using carbon fibres with technology that is ready to go, it is a pipe dream, rather than something to do in the here and now, if we are looking to do more

of this in the here and now.

[238] **Dr Lavis:** I agree. It is hard to give a figure; it depends what you do with the syngas. If you are producing things like diesel, a lot of the carbon in the syngas would go into that diesel and the carbon dioxide would be emitted elsewhere. You do not know how much carbon dioxide you might be able to use in projects such as coal-bed methane, because there are no projects there ready to accept it here and now. So, I would find it difficult to give you a direct answer on the amount of carbon dioxide that you would actually use, but my opinion is that CCS will always be required for fossil fuel use in the UK.

[239] **Antoinette Sandbach:** In the paper, some of the factors identified as the main issues that are hindering development are planning consent, financing and public concerns. What is your understanding of, for example, the planning expertise in this area in Welsh Government?

[240] **Dr Lavis:** We have had an initial meeting with Neath Port Talbot County Borough Council representatives to help them understand more about our projects and what UCG is. The people we met did not have much experience in UCG specifically. So, we think that we need to work with these organisations and give more information. We talk about doing things such as having exhibitions or workshops to raise knowledge levels on UCG.

[241] **Antoinette Sandbach:** Natural resources Wales comes into being on 1 April; it will be one of the overall regulatory bodies, because it brings together the Environment Agency Wales, the Countryside Council for Wales and the Forestry Commission Wales. Are you aware of any specific expertise within natural resources Wales?

[242] **Dr Lavis:** I am aware of some expertise in Environment Agency Wales, but not in natural resources Wales.

[243] **Antoinette Sandbach:** That will be merged into natural resources Wales, so what contacts have you had with that expertise and how are they looking at the issue of carbon capture and storage?

[244] **Dr Lavis:** I was part of an advisory group for the office of the Chief Scientific Officer for Wales. On that panel, there was a representative of Environment Agency Wales. So, I had direct communication with him there—I cannot remember his name, off the top of my head. We have communicated by e-mail since then. However, we are in the early stages of these projects at the moment and, as we progress, that communication will increase.

[245] **Antoinette Sandbach:** One of the other barriers that has been identified is public acceptance. What do you think the main issues are for members of the public, and how will you address them?

[246] **Dr Lavis:** Organisations such as Frack Off have contacted us, and one of the main issues is the level of knowledge about UCG; it is lumped in with unconventional gas and people think that we will be fracking, when, in fact, we will not be. Fracking is the main concern that has been raised by organisations such as Frack Off. From feedback that we have received, specifically, that is the main concern. Other issues, as we have discussed today, are those such as groundwater contamination, subsidence and carbon dioxide.

[247] **Antoinette Sandbach:** Subsidence is an issue that we have not addressed today, but we have addressed carbon dioxide and—

[248] **Dr Lavis:** We touched on subsidence. It is similar to mining, but you would expect less subsidence with UCG. Also, one of our key site-selection criteria is to target deep coal seams. Subsidence dissipates as it propagates up through the rock column, so the deeper you

are, the lower the risk of subsidence at the surface.

[249] **Mick Antoniw:** You referred to a dropping off of interest more recently in carbon capture and storage. Is that not because, commercially, it is no longer considered to be viable or to have any prospects? Is that why there is a focus on other forms of energy production?

[250] **Dr Lavis:** I am not really an expert in this field, but one of the concerns is—‘failure’ is a hard word to use—the difficulties with the carbon market. The price of carbon now is very low compared with what it was predicted to be—I think that it is \$20 per tonne or €20 per tonne; I do not know exactly, but the point is that it is much less than was hoped. So, companies looking to invest in the long term in carbon capture and storage have a lot of uncertainty as to the price of carbon going forward. That is probably one of the main issues. To expand a bit more, it is probably a global issue. Businesses do not want to have very high costs for their electricity in the short term—nor does the general public—while other countries are building coal-fired power plants every week.

[251] **Mick Antoniw:** Does that mean that, over the next couple of decades, the technology is just not going to be developed, and it is just not going to happen? It may be that some of the research will carry on but, in reality, in terms of commercial operation, it is just not going to happen, is it?

[252] **Dr Lavis:** Not for technical reasons. The technologies are there. It is using them, and getting the projects going ahead. There is Sleipner CCS, which has been storing carbon dioxide for years in the North sea; there are CCS projects in the US and elsewhere. The technology is there; for me, perhaps, it is about the business case for these companies to invest in CCS.

[253] **Mick Antoniw:** Is there any major practical commercial investment taking place that is moving towards some form of actual production, or is it all still within the realms of, I suppose, academia and research?

[254] **Dr Lavis:** I believe that it is at an early commercial stage with projects in the US, especially looking to store carbon dioxide commercially. As I say, I am not really up to date on that.

<p>[255] <b>Llyr Huws Gruffydd:</b> Roeddwn am holi ynglŷn â'r hyn rydych yn ei weld fel rhai o'r manteision economaidd i Gymru o ddatblygu'r potensial neu geisio gwireddu'r potensial hwn. Yn eich papur, rydych yn dweud y bydd hynny'n dod yn sgîl y ffaith y bydd nifer o weithwyr â sgiliau yn dod i ardaloedd yng Nghymru. I ba raddau y bydd buddiannau mwy cynhenid i'r economi?</p>	<p><b>Llyr Huws Gruffydd:</b> I wanted to ask about what you see as some of the economic benefits to Wales from developing the potential or trying to fulfil the potential here. In your paper, you mention that that will come in the light of the fact that a number of skilled people will come into parts of Wales. To what extent will there be more inherent benefits for the economy?</p>
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[256] **Dr Lavis:** That was really Julie's paper, but I will answer that as best I can. When we want to do an underground coal gasification project in a certain area, we are keen to use local expertise as much as possible. We may use local consultants—for example, we have SRK Consulting not too far from here, and there are other environmental consultancies around Wales that we can use to help us meet our environmental permitting obligations. As a company, we also work with universities; at the moment, Clean Coal Ltd is sponsoring an engineering doctorate student at Nottingham and, obviously, we have ties to Cardiff as well, and we would be interested in working with Cardiff University. In addition to that, a workforce would be required—it is not going to be a massive workforce, but it would be possibly 20 or so skilled workers—and on top of that you have the benefits from producing

energy or a chemical fuel stock for Wales itself. The specific benefits would depend on what you do with the syngas; as I said, you can convert it, or you can make electricity from it. That really comes out of the business case that we are developing, but those, I would say, are the main benefits to Wales from an UCG project.

11.30 a.m.

[257] **Llyr Huws Gruffydd:** Mae hynny'n ymwneud yn uniongyrchol â'r gwaith rydych chi yn ymwneud ag ef. A oes unrhyw waith wedi'i wneud i edrych yn ehangach ar y potensial fel sector? **Llyr Huws Gruffydd:** That relates directly to the work that you are involved with. Has any work been done to look more broadly at the potential from the sector as a whole?

[258] **Dr Lavis:** Do you mean in Wales, specifically?

[259] **Llyr Huws Gruffydd:** Ydw. **Llyr Huws Gruffydd:** Yes.

[260] **Dr Lavis:** For UCG in Wales as a whole, yes; we have focused on Swansea bay and our licence area, and we have looked elsewhere. Cardiff University has undertaken work, looking at the south Wales coalfield. It has developed a 3D geological model and applied geographical information systems using site-selection criteria to highlight areas of that coalfield that have good potential for UCG—not just in south Wales, but elsewhere.

[261] **William Powell:** Reference has already been made to the level of public concern regarding these UCG and other related developments. Do you feel that the current framework for environmental impact assessment that is required is sufficiently rigorous, given the innovative nature of the technologies that we are talking about?

[262] **Dr Lavis:** I think that its overall objectives are rigorous but what is not really known at this stage is how it will be implemented—the nuts and bolts of undertaking environmental risk assessment, for example. The techniques are there; they just need to be applied to UCG. The Environment Agency website makes a specific note that, for the first UCG project in the UK, significant amounts of effort will be required by the agency, working with consultants, to really understand what needs to be done prior to a UCG project. So, when we look at our project, we expect there to be a lot of time spent while it is going through the regulators, while the risk assessments are being done and while the environmental impact assessments are being done. We have written into our model how we will deal with that and we are expecting a year or more, perhaps, to really understand, and for the agency to be confident that it understands, the risks.

[263] **William Powell:** Earlier, a reference was made to the lessons that clearly need to be learned in the field of shale gas from experience in the United States of America, in terms of particular incidents and patterns of pollution that have occurred there. However, in relation to UCG, I think that you referred to Alberta and Queensland as two examples of where things have successfully been undertaken. Are there any lessons to be learned from the experience there, in terms of the level of regulation or any other issues around putting this into successful practice?

[264] **Dr Lavis:** For me, the Alberta situation is possibly the best example. There have been issues in Australia to do with overlapping coal tenements and all kinds of regulatory problems associated with coal-bed methane people wanting to extract coal that UCG people want to extract. For me, Alberta is an excellent example of how to do a UCG project. They have targeted coal—it is 1,400m deep—and they have undertaken extensive environmental assessments. The regulatory regime there is very well tailored. As I said before, it has experience of extractive industries from oil sands to CBM and gas injection. They have a very

good understanding of the risks associated with these activities, and I believe that that is an example of how to go forward.

[265] **William Powell:** Given the setting of Alberta or Queensland, my assumption would be that you are looking at much more extensive areas of terrain than would be the case here in the more compact setting of Wales and Swansea bay. Are there any particular additional risks that need to be taken into account here in the Welsh context?

[266] **Dr Lavis:** Outside of the coal and the geological setting being suitable for UCG, we need to consider the surface plant; that would be the main area. However, there are regulations in place to deal with air emissions, and there are the Control of Major Accident Hazards Regulations and the Control of Substances Hazardous to Health Regulations. These regulations are also in place. We look at this to identify brownfield sites that require a certain amount of regeneration. We have a legacy around Swansea bay of old refinery sites and all kinds of uses of the land there, and getting planning permission, by identifying these brownfield sites, is likely to be better than going to a nice greenfield site and trying to put something there.

[267] **William Powell:** Finally, you referred earlier to the difficulty that Neath Port Talbot County Borough Council had in bringing sufficient expertise to this area of activity. Given that that is going to be the case across the piece, I would suggest, in Wales in relation to this work, would Clean Coal Ltd potentially look at funding independent expertise to assist with the regulation and implementation of such a scheme? That technique has been used successfully in other areas of energy extraction and generation, but with the appropriate safeguards in place.

[268] **Dr Lavis:** First of all, I do not think that Neath Port Talbot council had difficulty in getting the expertise. It was just an early meeting; very preliminary. Sorry, you will have to remind me of your question.

[269] **William Powell:** It may be an inappropriate question that is more for an absent colleague. I asked whether Clean Coal Ltd would potentially look to assist with the funding of relevant expertise, given the relative difficulty of sourcing it and the associated cost.

[270] **Dr Lavis:** I would not be able to give you an answer on that; it is not really my role in the company to discuss that. My chairman and CEO are very active in those kinds of activities. Like I said, we are sponsoring a student. I would have to discuss that kind of thing with him, but I would say that it is more likely than not.

[271] **Keith Davies:** Gwnaethoch sôn am fae Abertawe, ond yr ydych hefyd yn edrych ar Afon Llchwyr yn yr ardal honno. Pam? Maent yn hollol wahanol. **Keith Davies:** You mentioned Swansea bay, but you are also looking at the River Loughor in that area. Why? They are completely different.

[272] Yn ail, dywedodd Gerwyn Williams yn gynharach yn y cyfarfod nad yw'n gallu gwneud unrhyw waith ar lo carreg. A yw eich system chi yn gallu gweithio mewn maes glo carreg? **Secondly, Gerwyn Williams told us earlier in the meeting that he could not do any work on anthracite. Can your system work in an anthracite coalfield?**

[273] **Dr Lavis:** We have only one area in Wales—it is Clough Energy that is involved in the other site.

[274] **Keith Davies:** Mae eich papur yn enwi— **Keith Davies:** Your paper names—

[275] **Dr Lavis:** Yes, but that is not our company.

[276] With regard to anthracite, yes, you can gasify it, but it is much more difficult than with lower ranked coals. The lower content of volatiles and water means that it is harder to get gasification going and to sustain it. So, for us, lower ranked coals are preferable.

[277] **Lord Elis-Thomas:** Diolch yn fawr. Thank you very much. We will be in touch, no doubt. If you have any further information, please contact us.

11.41 a.m.

### **Cyfoeth Naturiol Cymru Natural Resources Wales**

[278] **Yr Arglwydd Elis-Thomas:** Bore da a chroeso i gadeirydd a phrif weithredwr cyfoeth naturiol Cymru. Mae'n bleser eich cael chi yn ôl unwaith eto gerbron y pwyllgor, ac rydym yn ddiolchgar iawn i chi am eich parodrwydd i fod yn atebol i ni. Rydym wedi bod yn ymwneud â'r corff hwn ers y dechrau o ran yr achos busnes, ac, yn fwy diweddar, o ran y ddeddfwriaeth angenrheidiol, sef y Gorchmynion angenrheidiol ar gyfer gweithredu a chyfuno'r corff. Gadeirydd a phrif weithredwr, lle rydych chi arni ar hyn o bryd, ac a fyddwch yn barod ar gyfer y dathliad mawr yn Nhrefherbert ddechrau'r mis nesaf?

**Lord Elis-Thomas:** Good morning and welcome to the chair and chief executive of natural resources Wales. It is a pleasure to have you back again before the committee, and we are very grateful to you for your willingness to be accountable to us. We have been involved with this body from the outset in terms of the business case, and, more recently, in terms of the necessary legislation, namely the necessary Orders for operating and merging the body. Chair and chief executive, where are you at present, and will you be ready for the great celebration in Treherbert at the start of next month?

[279] **Professor Matthews:** Yes, we are ready. Lots of hard work is going on—long days and short nights—but we will be ready. The board is very confident in Emyr and his team. We will deliver and we will be ready on 1 April. We have a structure in place that is at about the right level. It is not as far as where we would like to be in terms of our future vision, but it is operationally resilient. We have a structure in place that will deliver a good operating organisation on 1 April, with a sufficient hint of the sunny uplands to which we go; in other words, a sufficient hint of the ecosystems approach to management. That is the direction of travel in which we are going. That is what I promised on 1 August and which Emyr has promised you; we have done exactly what we said we would deliver. I am very proud and very pleased, and impatient.

[280] **Lord Elis-Thomas:** It is good to hear that, but I hope that you also get to those very wet uplands where some of us choose to live. [*Laughter.*]

[281] **Dr Roberts:** I ategu sylwadau'r cadeirydd, rydym yn brysur ofnadwy ar hyn o bryd. Mae'r holl waith wedi dod at ei gilydd yn gyflym iawn dros yr wythnosau sydd wedi bod, a bydd hynny'n parhau dros yr wythnosau nesaf. Byddwn yn barod a bydd parhad yn y gwaith o ran yr hen drefn a'r drefn newydd. Rwy'n ffyddiog iawn o hynny.

**Dr Roberts:** To support the chair's comments, we are very busy at the moment. All of the work has come together very quickly over the last few weeks, and that will continue over the coming weeks. We will be ready and there will be continuity in the work in terms of the old regime and the new regime. I am very confident about that.

[282] **Russell George:** Good morning. There is some concern regarding self-policing and enforcement. Earlier this week, I spoke to colleagues in the Environment Agency in my office regarding some case work. I cannot go into detail, but the issue was that one of the three bodies is currently taking enforcement action against another of the three bodies. We had a consultation on the enforcement and prosecution policy of natural resources Wales, which is now closed. However, the consultation did not provide any information on how natural resources Wales would apply the policy to itself. Given that, and given that you have said that you are ready and confident for 1 April, can you talk about the processes that will be in place from 1 April to ensure transparency when one arm of the body takes enforcement action against the other?

11.45 a.m.

[283] **Dr Roberts:** Yes, indeed. It may help the committee if I describe what will be in place on 1 April. What we are effectively doing on 1 April is bringing all the existing teams from the three organisations into natural resources Wales as is, so they will be effectively in the same teams, with the same line management, carrying out the same functions. They are discrete units from that point of view. That is the current situation. Clearly, we will need to be very careful about any conflicts of interest during that period, but the teams are effectively sitting in their existing organisations for a while. However, what we will then do over the coming weeks and months is develop a more integrated structure. We are very well aware of the separation of duties issue, and, in fact, we had a discussion and a paper at the last board in February where we laid this out. So, we have a structure, which we are working to. We need to check the legalities of all of that, but we have a framework in place when we move to this integrated structure.

[284] On the enforcement action, those kinds of activities are going to be largely done by the operations part of natural resources Wales, and in our structure, the operations part is split into two, on a geographic basis—north and south. So, what would happen, in effect, on that particular issue, if we had to take that action, is that I would look to the other operations directorate to take the enforcement action against the one that had not done things properly. That is the kind of separation of functions that we are building into the system. As I said, we are still working on that, but it will be in place fairly shortly after vesting.

[285] **Russell George:** Do you have a published procedure in place currently, or will you have it in place by 1 April?

[286] **Dr Roberts:** We do not need one in terms of carrying on with the existing structures because they are functionally separate. It is just exactly what is happening in the Environment Agency and the Forestry Commission. However, we will have one when we move to this fully integrated structure.

[287] **Russell George:** When would you expect that to be?

[288] **Dr Roberts:** I would hope that we can complete that within two months of the vesting date. We are going through the appointments process at the moment for the next year within the organisation, and one of the main roles of the executive directors and that tier will be to firm up the organisation and the structure. I hope that all of that will have been completed within about two months.

[289] **Russell George:** You are expecting that by 1 June, for example, there will be a published procedure in place.

[290] **Dr Roberts:** Certainly by that date, yes. We are very mindful of this. I have spoken to all the executive directors in this interim phase to make sure that we do not compromise



ourselves with that kind of eventuality.

[291] **Lord Elis-Thomas:** No Pembroke power stations again then.

[292] **Dr Roberts:** I hope not.

[293] **Mick Antoniw:** That is a very important point with regard to how things are perceived, as well as how things happen in practice. Do you have any intention of appointing an independent individual to monitor and advise you independently as to the satisfaction that the systems are genuinely operating independently, and that, therefore, you are not at risk?

[294] **Dr Roberts:** The chairman might want to talk about this, but we have discussed this at the board and we are thinking about giving that kind of role to our audit and risk management committee, so that it takes an oversight of the separation of function duties to ensure that it is working as intended.

[295] **Professor Matthews:** It has certainly been very high on my 'must do' list. I think Emyr would agree that he and I have been pushing very hard for absolute clarity. There are many other things that internal audit has to look at in terms of probity of processes, and this seems a very good example. If our internal audit decides that it needs to get expert advice, in the same way that it gets expert advice on many other matters, it would do so.

[296] **Llyr Huws Gruffydd:** Un o'r cwestiynau amlycaf o safbwynt y staff yw strwythur staffio'r corff. A oes gennych unrhyw wybodaeth y gallwch ei rhannu gyda ni ar eich bwriad, o 1 Ebrill, ynghylch lle y bydd staff gwahanol yn ffitio i mewn?

**Llyr Huws Gruffydd:** One of the most obvious questions on the staff is the staffing structure of the body. Do you have any information that you can share with us on your intention, from 1 April, regarding where different staff will fit in?

[297] **Dr Roberts:** Penodwyd y cyfarwyddwyr cyn y Nadolig. Felly, y mae'r haen honno yn ei lle. Rydym wedi edrych ar y strwythur oddi tano ac rydym yn awr yn penodi staff i'r swyddi hynny. Mae tua 20 o swyddi yr ydym yn y broses o benodi ac rydym hanner ffordd drwy'r broses honno. Mae'r wybodaeth honno wedi ei rhannu gyda staff yn fewnol fel eu bod yn gwybod ble maent yn sefyll. Yr unig beth y byddwn yn ei ddweud yw, ar ôl gwneud y penodiadau hynny, bydd rhaid i ni adolygu'r sefyllfa er mwyn sicrhau bod y timau yn y lleoedd iawn. Felly, rydym yn y broses o adolygu hynny, cyn i ni gael strwythur terfynol. Fodd bynnag, mae hynny ar y gweill ac rwy'n gobeithio y bydd penodiadau i'r haen nesaf yn cael eu cwblhau erbyn pythefnos cyntaf mis Ebrill.

**Dr Roberts:** The directors were appointed before Christmas. Therefore, that layer is in place. We have looked at the structure underneath and are now appointing staff to those positions. There are around 20 posts that we are in the process of appointing and we are halfway through that process. That information has been shared with staff internally so that they know where they stand. The only thing that I would say is that after making those appointments, we will have to review the situation to ensure that the teams are in the right place. So, we are in the process of reviewing that before we have a permanent structure. However, that is in hand and I hope that appointments to the next level will be completed by the first couple of weeks in April.

[298] **Llyr Huws Gruffydd:** Er mwyn bod yn glir, unwaith y bydd y swyddi wedi eu llenwi, yna byddwch yn edrych ar y gwahanol isadrannau ac yn slotio'r staff i mewn o ran y llinellau o atebolrwydd hynny.

**Llyr Huws Gruffydd:** Just to be clear, once those posts have been filled, you will then look at the various sub-levels and slot staff in in terms of those lines of accountability.

[299] **Dr Roberts:** Yn hollol, ond roeddwn yn teimlo'n gryf ei bod yn bwysig ein bod yn cael trafodaeth gyda'r staff oherwydd eu bod yn gwybod y busnes a phwy maent yn delio â hwy ac, felly, roeddwn am sicrhau ein bod yn cael hynny'n iawn. Dyna pam nad ydym wedi rhuthro i mewn i hynny.

**Dr Roberts:** Yes, exactly, but I felt strongly that it was important that we had a discussion with the staff because they know the business and who they deal with and, therefore, I wanted to ensure that we got that right. That is why we have not rushed into that.

[300] **Llyr Huws Gruffydd:** A oes gennych unrhyw syniad ynghylch pryd y byddech yn hoffi i'r holl strwythur gael ei sefydlu?

**Llyr Huws Gruffydd:** Do you have any idea of when you would like the whole structure to have been established?

[301] **Dr Roberts:** Gobeithio y bydd gennym strwythur terfynol yn ei le o fewn dau fis. Efallai y gallwn symud ychydig yn gyflymach mewn rhai manau, ond byddwn yn gobeithio y bydd yr holl strwythur wedi ei gwblhau o fewn dau fis.

**Dr Roberts:** I hope that we will have a final structure in place within two months. Perhaps we can move a little more swiftly in certain areas, but I would hope that the entire structure will be complete within two months.

[302] **Llyr Huws Gruffydd:** A ydych yn teimlo bod yna elfen o risg yn y cyfamser y bydd dryswch yn codi neu bydd pobl yn gweithio ar draws ei gilydd?

**Llyr Huws Gruffydd:** Do you feel that there is an element of risk in the meantime that confusion will arise or that people will be working across each other?

[303] **Dr Roberts:** Nid wyf yn credu hynny oherwydd ein bod wedi cadw pobl lle'r oeddent. Maent yn gwybod beth yw eu rolau a byddant yn cadw at y rheini. Wrth i ni symud o'r lle yr ydym heddiw i'r strwythur newydd, mae'n bwysig bod pawb yn deall beth sy'n digwydd, ond mae dealltwriaeth o fewn y sefydliad o'r hyn sydd yn mynd ymlaen.

**Dr Roberts:** I do not think so because we have retained people where they were. They know what their roles are and they will stick to those. As we move from where we are today to the new structure, it is important that everyone understands what is happening, but there is an understanding within the organisation of what is going on.

[304] **Professor Matthews:** Perhaps I should say that, on the board, we have a lot of experience of this kind of transformation and we are following those experiences in terms of retaining clarity on what needs to be done in the day job on 1 and 2 April, and at the same time having clarity on the movement towards the new structure. We have addressed operational resilience on 1 April as being an absolute priority.

[305] Secondly, right from the beginning, we had a concept that we needed to understand—what we have called, 'activity blocks'. The picture that we have had is that with the clarity of activity blocks, we can reconfigure the structure a bit like Lego blocks. We have also had the concept of a responsibility matrix so that there is absolute clarity on what people are responsible for. That starts with clarity about what our Minister expects and what he is responsible for; what I am responsible for and what the board is responsible for, cascading all the way down so that everyone knows exactly what they are responsible for. I explained to you before that that concept has migrated right across the structure so that, for example, even in the board committees, we do not have terms of reference, which I think is a very old-fashioned expression, but terms of responsibility—everyone knows what they are supposed to do.

[306] **Lord Elis-Thomas:** You have given me a great idea that we should change our terms of reference in this place to terms of responsibility. I would love that—thank you.

[307] **David Rees:** Could I seek clarification because I am a bit confused now? You talked about developing a more integrated structure and yet you are talking about appointing people at a higher level within that structure. So, what will happen? Will the structure change? Will people's responsibilities therefore change as a consequence of that? How will it all work because I would have thought that you would have had the concept for the whole structure in place before you started appointing at that level and before you decided what would go below it?

[308] **Dr Roberts:** We have a good knowledge of the final structure. However, the point that I am trying to make, I think, is that when we have everyone together we need to make sure that that actually makes sense. There will still be scope to move some functions between individuals, if that makes sense. I just want that almost quality assurance of the process. We are appointing people to specific jobs. They understand that and there are job specifications for this. So, they have a good understanding of that. All I am saying is that we may need to fine-tune that in the light of knowledge that we pick up over the next few weeks.

[309] **David Rees:** Are those who have been appointed fully aware of the implications—

[310] **Dr Roberts:** Yes, indeed. As I said, I do not think that there will be a fundamental change in that. We would have flagged that up if that was the case, but in terms of whether a specific team goes to this place or that place, I just want the space to think about that a bit more.

[311] **David Rees:** As part of that structural thinking, have you also looked at the district and boundaries that they cover? Obviously, they are different. The Forestry Commission covers four districts and different districts are covered by the Environment Agency.

[312] **Dr Roberts:** Yes, that is laid out. We are considering five areas within natural resources Wales, and we have defined those. So, yes, we are appointing people at an area level. So, we have done that thinking.

[313] **Professor Matthews:** Perhaps I could add that it is really important—and I keep saying this—that we have clarity on what we are trying to do. At the beginning, the board, Emyr and the Living Wales programme debated what the broad outline of the structure would be, and we made the executive director appointments on the broad principles of what we needed to deliver. When that team is in place the next step is for it, as an executive team, to understand what the broad principles are, to deliver a more detailed structure. I will reflect that, perhaps, if you are not already aware, we could let you have details of the executive director team that we have appointed so that you can understand the broad thrust of the organisation. Then, of course, we can update you when that next tier, the heads of activity, are confirmed and in place. We have created a storyboard of the creation of the organisation, and it stops with the creation of the executive directors' team. I am happy to share that with you so that you can understand where we have got to, as at that point in January. Then, we can update you as at the point that we get to in April.

[314] **Dr Roberts:** I am perfectly happy to share the organogram, as it is, with the committee. It is public knowledge. Obviously, staff have seen it. I see no reason why the committee should not see it. That might help to answer some of the questions. There is just that caveat that, subject to the fine-tuning, I would be very happy to send that to you, Chair.

[315] **Lord Elis-Thomas:** That would be very helpful. I have detected a lot of enthusiasm from that devil of the organisation, as well as from individual board members, so it would be good to have that confirmed. William Powell, Keith Davies and Antoinette Sandbach have questions.

[316] **William Powell:** Good morning, both. Professor Matthews referred earlier to the importance of resilience in the organisation from 1 April onwards. Another important aspect of business continuity, I would suggest, is consistency of advice with the advice offered by the predecessor organisations, particularly where you are talking about issues around investment or certainty with regard to being able to develop a particular project. What provisions are in place to ensure that that consistency is present?

[317] **Dr Roberts:** That is a major factor for us. Obviously, we inherit the policies and the investment decisions from the legacy bodies, and we will carry those through. With particular regard to casework on this, we are aware that, in a few instances, the views of the organisations are different. So, I have asked the executive directors to look particularly at those cases to make sure that we are consistent going forward from 1 April. We have a list of particularly the high-profile casework, which is on the stocks at the moment. We know exactly where things are in terms of the developments, and so on. So, I have asked them to particularly take a view on each of those to ensure that we will be consistent in going forward. So, we are managing that.

[318] **William Powell:** That reassurance will certainly be well received. I wonder whether there are particular provisions in place for high-profile and important projects, such as the all-Wales coastal path, in particular, where the pace of taking that forward and the partnerships with local authorities and other stakeholders are so critical. That is something about which I seek particular reassurance.

12.00 p.m.

[319] **Dr Roberts:** Yes; that is a priority for us. It is a significant investment, and in my view, a significant opportunity for Wales. There has been some good news recently; the Minister has extended the funding for that, and we are very grateful as that provides continuity on that important project.

[320] **William Powell:** Finally, what arrangements are in place for the ongoing work with local authorities, national parks and special purpose local authorities to minimise the risk of advice received by members of the public from those bodies being attributed to a lack of business continuity to the disruption that could be portrayed as having come with the vesting? You are reassuring us that that will not be the case and I am sure that we accept that in good faith, but at the ground level, there is a danger that this could be used as an alibi for bad practice or delays and so on. Therefore, relationships with local authorities and national parks are particularly important.

[321] **Dr Roberts:** Absolutely. We have made it clear to all our stakeholders, particularly local authorities and national parks, that they are to use their existing contacts within the organisations, which they know well and have developed over the years. So, there will be continuity from that point of view. As an organisation, we would be very keen to build on those contacts, so I am attending some of the local authority regional boards, for instance, to talk directly to the leaders and chief executives. So, it is very much about continuity in terms of those relationships.

[322] **William Powell:** Have you had the opportunity yet to address the Welsh Local Government Association in session, or is that something that you will look at sooner rather than later?

[323] **Dr Roberts:** I discussed this with the chief executive and he suggested that it would be best to start with the regional boards, so that is where talks with the leaders and chief executives will take place. Three of those meetings are coming up and I will be attending two

of them and another of the executive directors is attending one. So, that is the start of a dialogue with local authorities.

[324] **Professor Matthews:** I have also been in discussion with the WLGA.

[325] **William Powell:** Thank you, both.

[326] **Keith Davies:** Bore da. Gofynnaf i fy nghwestiwn yn y Gymraeg. Mae dod â chyfoeth naturiol Cymru i fodolaeth yn dipyn o sialens, nid yn unig oherwydd eich bod yn dod â thri chorff gwahanol at ei gilydd yng Nghymru, ond mae dau ohonynt yn rhan o gyrff sy'n cael eu rhedeg yn Lloegr. Derbyniaf fod yn rhaid i chi gael cytundebau gwasanaethau sy'n gweithredu'n awr, ar ôl Ebrill. Y cwestiwn mawr yw: ble rydych chi arni o ran cael cytundebau'r gwasanaethau, o'r ddau gorff yn Lloegr, er mwyn sicrhau y byddwn yn gallu rhoi'r cyngor yng Nghymru yr ydym yn ei roi'n bresennol? Fe ddylwn i ddweud wrthy ch hefyd, bod diddordeb mawr gennyf, oherwydd bod y labordy yn Llanelli.

**Keith Davies:** Good morning. I will ask my question in Welsh. Bringing natural resources Wales into being is quite a challenge, not only because you are bringing three different bodies together in Wales, but two of them are part of bodies that are run in England. I accept that you have to have service agreements that are now operational, after April. The big question is: where are you now in terms of getting the service agreements from the two bodies in England, to ensure that we will be able to provide the advice that we currently give in Wales? I should also say that I have a great interest, because the laboratory is in Llanelli.

[327] **Dr Roberts:** Rydych yn iawn i ddweud bod yr ysgariad wedi bod yn fwy poenus na'r briodas, i rai aelodau staff, yn sicr. Fodd bynnag, rydym wedi bod yn gweithio'n galed i gael cytundebau yn eu lle ar gyfer y gwasanaethau; mae nifer fawr ohonynt ac maent yn cael eu gwneud ar hyn o bryd. Felly, rwy'n disgwyl arwyddo nifer ohonynt dros yr wythnosau nesaf. Mae cydweithrediad da wedi bod rhyngom ni, Asiantaeth yr Amgylchedd a'r Comisiwn Coedwigaeth ar hynny. Mae'r berthynas wedi bod yn dda iawn. Mae hynny'n cynnwys y labordai ac rwy'n falch iawn eu bod wedi dod i mewn i gyfoeth naturiol Cymru; mae'n adnodd pwysig i ni yng Nghymru, ac nid yn unig i ni fel corff, ond ar gyfer Cymru gyfan yn nhermau gwyddoniaeth ac yn y blaen. Mae'r ddau ohonom wedi bod i'r labordai yn barod ac yn edrych ymlaen at gael gwasanaeth labordy dros Gymru.

**Dr Roberts:** You are right to say that the divorce has been more painful than the marriage, particularly for some members of staff. However, we have been working hard to get those agreements in place for services; there are many of them and they are being brought together at present. So, I am expecting to sign a number of them over the coming weeks. There has been effective collaboration between us, the Environment Agency and the Forestry Commission on that. The relationship has been very good. That includes the laboratories and I am pleased that they have been incorporated into natural resources Wales; it is an important resource for us in Wales, not only for us as a body, but for Wales as a whole, in terms of science and so on. We have both already visited those laboratories and we look forward to seeing a laboratory service for Wales.

[328] **Antoinette Sandbach:** I know that you dealt with the enforcement function, but one of the risks that we identified in our earlier scrutiny was that there would not be sufficient separation of regulatory and consenting functions. Are those also being delayed until 1 June and does that mean that decisions are put on hold for another few months? There has been a great deal of uncertainty about how the body will operate and the Seaport Environmental Ltd case is something we looked at in quite some detail.

[329] **Dr Roberts:** There are a couple of things in there. The regulatory functions will carry on, obviously. We have important roles to play on that, and in fact we have discussed at the

board issues like SSSI designation, and so on, and we have structures in place for that. So, that carries on. In response to the Seaport issue, I refer back to the earlier comment: that is part of the separation of functions that we are working on at the moment, and so we have discussed that at the board and we have a proposal for dealing with that.

[330] **Antoinette Sandbach:** You said that you are ready to go. Obviously, that is something that affects quite a number of organisations, potentially. When are you going to publish that proposal?

[331] **Dr Roberts:** We are talking about regulation here, are we?

[332] **Antoinette Sandbach:** No, we are not. We are talking about permitting—for example, where there may be consenting issues on Forestry Commission land.

[333] **Dr Roberts:** Sorry, yes; I understand now. On consenting and permitting, the situation is that we are bringing a paper to the board in March on how we will handle that on day 1. As you will know, the three organisations currently have arrangements to have that separation on permitting, and particularly on self-permitting. What we have done is effectively bring together the policies from the three organisations into one document, and we will be publishing that. However, we accept fully—and, obviously, it is in the Order—that we need to review that going forward and that we need to have a public debate around that, and we will start that consultation with the new organisation going forward. So, on day 1 we will have a policy largely based on the current organisations' policies on how we handle self-permitting and so on, and we will be publishing that information. Going forward, we will be reviewing that document and having a public consultation on it.

[334] **Antoinette Sandbach:** I think that Seaport requires effectively separate secretariats and support. Is that structure in place?

[335] **Dr Roberts:** That is one of the proposals going forward. As I say, we will get to that within a couple of months of setting up natural resources Wales.

[336] **Antoinette Sandbach:** Are you therefore not planning to take decisions that may lead to conflicts in the meantime? I am trying to see what the transitional arrangements are. If decisions are taken and that information is not publicly available, or that practical separation of powers is not actually in place, then that will surely risk natural resources Wales being in breach on Seaport.

[337] **Dr Roberts:** There will be relatively few Seaport-type examples coming forward. We will be very mindful of that. Going back to the first question, as I say, we are keeping the existing structures in place in the interim period to achieve that separation. Over time, we will need to integrate it, and that is where the separation of duties needs to be very clear.

[338] **Antoinette Sandbach:** My understanding was, from what you said on the human resources side, that you were anticipating merging the three bodies sometime in June. Therefore, the potential for accidental access to information, or whatever, is much higher in June, and what I am concerned about is what steps are in place now to mitigate those risks.

[339] **Dr Roberts:** On the special environmental areas, and so on, these are very high-profile cases, so we know about them and are very mindful of them. We will treat those on a case-by-case basis to make sure that there is not that accidental transmission of information. As I say, we will put in place separation of functions when we move to a fully integrated structure.

[340] **Antoinette Sandbach:** Some of the evidence before the committee a couple of weeks

ago was that you were having to bring forward your IT development because of a lack of agreement, or because you were having to pull out of the Environment Agency earlier than anticipated. Again, what sort of safeguards will be in place through the IT structure to ensure that there is not that ability to look at information, and so on?

[341] **Dr Roberts:** On day 1 on the IT, there will be a commonality in the sense of having one e-mail address, one internet, one intranet and one document management system, but staff will be working off the legacy bodies' IT systems, and one of the things that we will have to do is bring those together into a single IT system going forward. That will take some time. We want to get on with it as quickly as we can, but that will take time. So, in terms of the protection of information, people will still be on their existing systems—they will take access across, if you see what I mean.

[342] **Antoinette Sandbach:** Not even with the shared document system.

[343] **Dr Roberts:** No.

[344] **Professor Matthews:** To add to what Emyr has been saying, the board is very mindful of these issues. One of the things on which we have not elaborated, but which you will see in the structure, is that we have a transition team and a head of transition. His job is to help us to manage this difficult process. Those of you who have been involved in these practical issues will know that we cannot wave a magic wand at midnight on 31 March and suddenly transform the organisation overnight. We have to carry on doing the day job, and we must have clarity about the process that we are going to go through in order to make the transition. We have a transition team whose job is to see us through these difficult issues. We also have a very strong governance team to look at processes. The governance team will be dealing with communication, internal audit and a whole variety of governance matters.

[345] I ask you to be patient with us. This is a huge change and, to be blunt, things might go wrong. Our job through the transition team is to ride point on this, and to be able to respond quickly when issues arise that are caught between the old system and the new system. So, we are very mindful of the challenge of transition, and we have a set of people and a set of processes to manage that transition.

[346] **Antoinette Sandbach:** What key performance indicators have you put in place to highlight where that transition may not be effective?

[347] **Professor Matthews:** We are working on the key performance indicators right now.

[348] **Antoinette Sandbach:** So, there are none at present?

[349] **Professor Matthews:** I did not say that; I said that we are working on them and that we will have them in place.

[350] **Antoinette Sandbach:** When?

[351] **Dr Roberts:** We will need to put in place a benefits realisation plan to meet the benefits that are in the business case. That will be part of our work going forward. In terms of our KPIs, we have a whole raft of KPIs from the existing legacy bodies that we will continue. In due course, we will need to review those to make sure that they are fit for purpose going forward. That is the way in which we are going to handle that.

[352] **Antoinette Sandbach:** Will you be reporting publicly on those KPIs?

[353] **Lord Elis-Thomas:** Of course he will—he will be reporting to us for one.

[354] **Mick Antoniw:** I want to move on to another—

[355] **Lord Elis-Thomas:** Yes, please.

[356] **Mick Antoniw:** One of the things that we discussed when we last met with you was the transition in terms of cross-border arrangements with regard to technology, research and a whole variety of areas. You talked last time of being in the process of signing a memorandum of understanding and various protocols. Where are we on those at the moment?

[357] **Dr Roberts:** Those are still being worked on, and I anticipate signing those off before the end of March. As well as with the individual service areas, there will also be an overarching memorandum of understanding with both the Environment Agency and the Forestry Commission. On the cross-border issues, there are specific agreements on those, for instance, on the management of the Dee estuary.

[358] **Mick Antoniw:** So, it is all going to plan and there is nothing that has arisen that has created any major concerns.

[359] **Dr Roberts:** I do not anticipate any problems on that.

[360] **Yr Arglwydd Elis-Thomas:** Ar y **Lord Elis-Thomas:** With regard to cysylltiadau rhyngwladol, beth fydd rôl y international links, what will be the role of corff o fewn y Cydbwyllgor Cadwraeth the body within the Joint Nature Natur, y JNCC? Conservation Committee?

[361] It is one of my favourite institutions, as I have explained to you, Professor Matthews.

[362] **Professor Matthews:** I understand that I have a commitment, which I am very happy to take up. I am due to meet the chairman and chief executive of the JNCC on 13 March, which I think is Wednesday of next week, to talk about the future arrangements. I see that I will carry my personal commitment and we will carry on playing a full role.

[363] **Lord Elis-Thomas:** Thank you. The importance of this institution is that it is a federal institution, and has international representation in its own right. It is very dear to me because I was there at its birth. I am not saying that I was its midwife—that was the now Lord Roberts of Conwy—but I was pretty close to the event. [*Laughter.*]

12.15 p.m.

[364] **Mick Antoniw:** In a sort of voyeur capacity, was it? [*Laughter.*]

[365] **Lord Elis-Thomas:** Yes. Llyr is next.

[366] **Llyr Huws Gruffydd:** Un o'r pethau a drafoddom â chi y tro diwethaf yr oeddech o flaen y pwyllgor oedd yr angen i greu strwythurau ymgysylltu â rhanddeiliaid a'r rôl a fyddai ganddynt i'w chwarae, efallai mewn grŵp ymgynghorol neu rywbeth. Ar y pryd, dywedoch nad oedd prinder cyngor—dyna, rwy'n meddwl, oedd eich geiriau chi. A ydych wedi dod i unrhyw gasgliad ynglŷn â'r ffordd orau o symud hynny yn ei flaen?

**Llyr Huws Gruffydd:** One of the things that we discussed with you the last time you came before the committee was the need to create structures to liaise with stakeholders and the role that they would have to play, perhaps in an advisory group or something. At the time, you said that there was no shortage of advice—those were your words, I think. Have you come to any sort of conclusion about the best way of moving that forward?



[367] **Professor Matthews:** The advice has poured in since the last meeting. *[Laughter.]* We have already talked about this at the board twice, and we are moving forward. I should just explain to you how we are moving forward. You know that when I came to you before, I talked about our model, which was about communities, the economy, environment and knowledge. You know: the creation of a greener, wiser, wealthier, healthier Wales. In that context, we have mobilised our board into board groups around those issues. So, rather than having a board group on waste or water or fisheries or whatever, we have mobilised the skills of the board into groups around those four issues. The one on the economy will, I think, almost have two functions: one will deal with our own enterprise activities, as well as with our wider role in the economy.

[368] The board group on communities has been charged with coming back to the board, in concert with our executives, having come up with some more precise ideas about how we are going to move forward with stakeholders. So, we are already beginning to think in terms of the way in which we might move forward. One of the concepts that we have is that, certainly where the board is involved, the board groups will be an interface with outside groups, according to the nature of the group. For example, we have a group on the economy to work on that where we need to interface with outside groups.

[369] We are already getting invitations for us to participate in various groups, and we are already beginning to assign our board members to be involved with those groups. For example, one of the board members is taking over the chairmanship of a stakeholder group that deals with land management—so, it is ConFor and farming and so on. Another one of our board members is taking on responsibility for the national access forum and so on. However, we already recognise in our structural thinking that there is a place for local groups—this would be for our operations people to have their own community groups in terms of local activities. There is a lot of room for our executives to be involved in a number of stakeholder activities, and there are also these more formal groups that we are involved with.

[370] I said before that I am a great aficionado of structured informal networks, which has gone down very well with our stakeholders. That is, rather than creating a long string of bureaucratic organs—committees with agendas and so on—we have a relationship with a series of stakeholders so that we can network with and then call a meeting as and when the need arises, or when they say the need arises. That gives us flexibility. In the examples that I have given, we could call a stakeholder meeting on poverty, on the issues affecting the relationship between utilities and the environment, between faith groups and the environment, or between tourism groups and the environment. It gives us a better way of communicating with the communities and the economy of Wales. So, that is the way in which we are going at the moment. We are living the values. The way that we are going to do things in future is the way that we are going to deliver the answer to your question. We are very much on top of this, but we have not finished our thinking yet.

[371] **Llyr Huws Gruffydd:** Diolch yn fawr iawn i chi am hynny; mae hynny'n swnio'n addawol iawn. O ran y bwrdd ei hun, pa ystyriaeth a ydych chi wedi ei rhoi i sut y gallwch chi sicrhau bod penderfyniadau'r bwrdd yn dryloyw, a pha drefniadau sydd gyda chi mewn golwg o safbwynt cynnal y cyfarfodydd yn gyhoeddus ac yn y blaen ar ôl 1 Ebrill?

**Llyr Huws Gruffydd:** Thank you very much for that; that sounds very promising. In terms of the board itself, what consideration have you given to how you can ensure that the board's decisions are transparent, and what arrangements do you have in mind for conducting the meetings in public and so on after 1 April?

[372] **Professor Matthews:** I am aware of the fact that you are aware that we have conducted our meetings in private. It is not so much in private; it is just that all the issues that we have been dealing with have been very much matters such as debating the remit letter and

going through the scheme of delegation and so on. We will be holding all of our meetings in public from 1 April, so our first meeting in public will be on 22 May, I think. At the moment, we are planning that, when we go around the nation, there will be arrangements and an opportunity for the board to meet local people and for local stakeholders to talk to the board directly. Our minutes will be available; they will be published quickly and efficiently, as soon as they have been signed off, on the web. Our meetings will be held in public and there will be an opportunity for us to meet local people when we go around the nation.

[373] **Russell George:** Llyr asked the question I wanted to ask, as it happens. I am very encouraged to hear that all the meetings, from creation, will be held in public. One comment I had is that you said at the beginning of this session that you are going to be ready and confident, and, later on, you said that there is no magic wand and there will be things that go wrong. I am not suggesting that one contradicts the other, but has the timetable of the creation of the new body by 1 April been too tight a deadline for you?

[374] **Dr Roberts:** It has been a demanding deadline. Ideally, we could have started earlier, but I do not think there will be any weaknesses in the system because of it. In fact, it is quite good to have a demanding timetable put in front of you because that brings out the best in people. I have been really impressed with the Living Wales programme, which I inherited and have taken forward. That has brought people together. It is tight at the end, but it is achievable. I think that the timing has been just about right, really.

[375] **Professor Matthews:** I just want to add that none of the things that I or Emyr have said are inconsistent. I am confident, because I know what we need to do, and I know the pitfalls that we are going to face, because we are practical people who have done this sort of thing before and, of course, I have been talking to Emyr coming over about running through the final checklist on safety, on managing major incidents, and asking, 'Is this in place, is that in place, and is everything ok?', testing the system to make sure that we are robust. We recognise as well, as practical people, that we can sit there exuding confidence, but something is going to go wrong on the frontline. We understand that it will go wrong and we will respond quickly. It is about having clarity about the things that we need to do and put in place. Not having it all at midnight on 31 March does not mean to say that we are not confident about being able to deliver this big transition.

[376] **Russell George:** I fully appreciate that. Going back to the public meetings, following Llyr's question, will details of the meetings that have taken place prior to 1 April be made public?

[377] **Dr Roberts:** Yes. We will be launching the internet site later this month, and all the minutes and papers of previous meetings will be on that.

[378] **Russell George:** From the very first board meeting?

[379] **Dr Roberts:** Yes, that is right.

[380] **Professor Matthews:** You will understand that we have been getting to know one another as board members and setting up the audit committee and all that sort of stuff. All of that will be available in the public domain.

[381] **Lord Elis-Thomas:** David Rees is next and then Antoinette, and then, unless there are other questions, I will wind up.

[382] **David Rees:** I want to ask about two areas. The first one is about planning, workloads and work scheduling. Clearly, you are taking over three bodies, which all have their own individual work schedules for several years. If we take the example of the Forestry

Commission, phytophthora and ash dieback are causing problems, but there is a long-term plan to deal with those. You are now talking about changing internal structures and districts. Will those work plans be adhered to so that people and businesses that operate in that area have the confidence that what they are being told will continue to go ahead?

[383] **Dr Roberts:** Yes, very much so. Those work plans will be rolled forward and, in fact, we had a discussion at the last board meeting about our business plan for 2013. Much of that is about existing programmes. The plant health issues that you mentioned are a very important part of that. So, that work will continue. Obviously, as you would expect, over time, we will review our priorities, but we will immediately continue with all of those plans.

[384] **David Rees:** The plan for phytophthora, for example, is a five-year one in the south Wales Valleys area.

[385] **Dr Roberts:** I anticipate that continuing and it is important to have certainty on that.

[386] **David Rees:** We have talked about the three main bodies, but the marine consents unit is also coming on board. Where are we with progress on that and what are the staffing issues related to that?

[387] **Dr Roberts:** Yes, that function is coming in. We advertised the posts within natural resources Wales and no-one from the Welsh Government team wanted to move into natural resources Wales, so we appointed a team that is currently working alongside the marine consents unit in the Welsh Government. They are being trained up, as we speak, on what to do and what to expect. We have also secured an oversight function by an existing member of that unit, should we need to draw on it for the first six months. So, I am quite confident that we have got the right arrangements in place there.

[388] **David Rees:** So, effectively, you have established a brand new team.

[389] **Dr Roberts:** Yes, but it is also right to say that several of the people appointed to that team are used to those consenting-type issues in a previous capacity, albeit not marine ones, but they do have consenting experience.

[390] **David Rees:** The internal structures that you have talked about obviously take into consideration this aspect and the concerns that the stakeholders had beforehand about the MCU coming into the body.

[391] **Dr Roberts:** Yes. I think that we will offer a good service. Obviously, I hope to improve on the existing service, but the main point for stakeholders is that, again, we will have one place for them to submit a development application, for example, and we will respond to that as a single organisation rather than stakeholders having to go to more than one organisation, which is the current situation.

[392] **Antoinette Sandbach:** Professor Matthews, you spoke about the remit letter from the Welsh Government. Are you clear what your responsibilities are and the responsibilities of the sponsor department of the Welsh Government? Again, I may be showing my ignorance, but I do not know whether that remit letter is in the public domain yet.

[393] **Dr Roberts:** Not yet. We are in discussions with the Welsh Government on the framework document, which is the overall framework of how the department will manage its relationship with us. There was a discussion at the last board meeting on that. Likewise, we are also in discussions on the remit letter. We are expecting those to be issued before the end of March.

[394] **Antoinette Sandbach:** Will you be designated the additional accounting officer on or before 1 April?

[395] **Dr Roberts:** Yes, I will be the accounting officer for natural resources Wales.

[396] **Professor Matthews:** Every one of us, the Minister included, is very clear that we need to be clear. I wish to reassure you that, in this plethora of proper focus on governance and processes, we have not forgotten the environment or stakeholders. I should perhaps say on stakeholders that we are spending many long hours travelling around Wales, meeting all sorts of different people. We were looking at the list of people whom we have met and it is a huge list of all sorts of different people. You asked us before about meeting stakeholders and I think that we can reassure you that we have done that. This afternoon, we are going to see renewable power representatives; yesterday I met the waste industry and, in the morning, I met the water industry and so on.

12.30 p.m.

[397] The second thing is that—this is in the public domain, so there is no harm in telling you—that we have already taken some initiatives around our broader responsibilities. We believe that we can play a role in Wales in promoting green education. I have already been in correspondence with the Minister for Education and Skills, saying that there is a place for green secondary education around sustainable development and natural resources management, so that, when young people leave school, they really are fit for purpose for a green, knowledge-based economy. The Minister has responded very favourably and we see us working with that ministry in taking forward that concept. You will see that we have also made a very positive response to the sustainable development Bill. Having given a great deal of thought to this, we have given very positive support. We know that we have a really important role in Wales to demonstrate the application of sustainable development. We have also made a proposal that there should be an eighth principle of public life in Wales for public office holders—a commitment to sustainable development. So, alongside the seven Nolan principles, there should be an eighth Welsh principle for holders of public office in Wales. That sounds like a very simple statement, but we gave a great deal of thought to that. Let me reassure you that, alongside all this other grunt and grind stuff, we really are thinking about the bigger picture in terms of where we want to go in Wales.

[398] **Yr Arglwydd Elis-Thomas:** Diolch yn fawr i'r cadeirydd a'r prif weithredwr. Diolch am eich parodrwydd i ddod i'n gweld mor gyson yn y misoedd diwethaf. Rwy'n teimlo y dylem adael llonydd ichi nawr am ychydig o fisoedd. Fel pwyllgor, rydym wedi cynhyrchu adroddiadau sylweddol sy'n ceisio dylanwadu ar bolisi'r Llywodraeth ac ar weithrediad cyhoeddus yng Nghymru. Rwy'n cyfeirio at y ddau adroddiad mawr ar gynllunio ac ynni ac ar agweddau morol. Mae'r ddau yn bwysig iawn inni a byddant yn effeithio yn fawr arnoch pan fyddwch wedi'ch sefydlu, gan eich bod yn gyfrifol am weithredu'r pethau hyn. Efallai y byddai'n dda o beth, pe byddech yn cytuno, inni gael rhyw fath o gyfarfod blynyddol gyda'r corff hwn ar yr un lefel ag y byddwn yn craffu ar Weinidogion ac ar agweddau eraill ar waith y Llywodraeth. Fel y gwyddoch, rydym wedi

**Lord Elis-Thomas:** I thank the chair and the chief executive. Thank you very much for your willingness to visit us so regularly over the past few months. I feel that we should perhaps leave you alone for a few months. As a committee, we have produced substantial reports that endeavour to bring influence to bear on Government policy and public implementation in Wales. I am referring to two significant reports, one on energy and planning and the other on marine policy. Both are very important to us and will have a great bearing on you once you have been vested, because you will be responsible for implementing these things. Perhaps it might be positive, if you agree, that we should have some sort of annual meeting with this new body on the same sort of level as we would scrutinise ministerial activity and other aspects of Government work. As you will

cymryd diddordeb mawr ynoch o'r dechrau ac nid ydym yn debyg o'ch anghofio. Yn sicr, ni fydd cyfle ichi ein hanghofio ni. Diolch yn fawr iawn ichi.

know, we have taken a great interest in you from the very outset and we are not likely to forget you any time soon. Certainly you will not be allowed to forget us. Thank you very much.

[399] **Mr Roberts:** Diolch yn fawr.

*Gohiriwyd y cyfarfod rhwng 12.32 p.m. a 1.29 p.m.  
The meeting adjourned between 12.32 p.m. and 1.29 p.m.*

### **Nwy Siâl a Nweiddio—Tystiolaeth gan Ganolfan Tyndall Shale Gas and Gasification—Evidence from the Tyndall Centre**

[400] **Lord Elis-Thomas:** Thank you for your patience, Professor Anderson and Dr Broderick. Since you gave us evidence in November of last year, when we were looking at energy policy, the UK Government has published its gas generation strategy. To start with, we are very interested in hearing what you thought of that. I think that I know the answer.

[401] **Dr Broderick:** The priority, as we see it, is to consider the decarbonisation of the grid in the near term. That is going to require substantial investment in renewables' generating capacity, but also in the supply chain to provide that generating capacity. We have not done any direct work with investors or the manufacturing sector, but we have heard from others that the commitment to a grid decarbonisation target is important in securing that investment in the UK, so that the benefits from hosting the supply chain in terms of employment and revenues accrue to the UK and that renewable technologies are not solely imported from overseas.

[402] **Professor Anderson:** I think that it would be fair to say that the suggestion of 27 to 37 GW of new gas capacity is incompatible with our commitment on 2 degrees centigrade—either the UK commitments or the Welsh Government's commitments—that we made and reaffirmed at last year's G8 event in Camp David. We cannot reconcile that new suite of gas generation with our 2 degrees C commitments. I think that we go slightly further and say that the Government's proposals are hard to reconcile—if not irreconcilable—with its own Committee on Climate Change's decarbonisation agenda for electricity by 2030, or thereabouts. The other thing is that there is a general belief that, if we could have a gas strategy in the UK and if we could supply that ourselves from shale gas to a reasonable degree, that would provide us with a buffer against price volatility. I think that John and I would say that there is some scepticism as to whether that is true. So, both from an economic and climate change perspective, I think that this is probably not the right route to go down.

[403] **Lord Elis-Thomas:** You clearly do not buy into any notion that gas—whether conventional or unconventional—can close a short-term gap before we move into greater renewable dependency.

[404] **Professor Anderson:** It could certainly close the short-term gap—if we accept the case that there is one—in terms of electricity generation. However, by closing that gap, it would mean that we would have to renege on our 2 degrees C international commitments, or we would have to finesse them in a way that would be disingenuous, to be blunt. That is not to say that there is no scope in poorer parts of the world for gas to be a transition fuel, but in a wealthy part of the world, like the UK, we have to acknowledge that we have to get our emissions out of the system much faster than the poorer parts of the world, and we cannot do that with gas.

[405] **David Rees:** I have a simple question: why should we not go for shale gas? Take the decarbonisation issue away for a moment, because I understand the role that you have there and the longer-term objective, but if shale gas is going to reduce carbon emissions, as is claimed, why should we not go for it?

[406] **Dr Broderick:** The claim there is that, if shale gas is to reduce emissions, it is on the basis that it is comparatively less polluting per unit of useful energy—either as electricity or heat produced—than other fossil fuels. There is an implicit assumption that the other fossil fuels remain underground—that there is a substitution and that the production of shale gas is not in addition to other sources of fossil fuel. We did some preliminary research last year to look at what has happened in the US. What we can see there is that the production of coal has reduced slightly, but not substantially. In fact, the reductions in emissions from the US energy system, that may be attributed in part to an increase in shale gas production and consumption, are, to some extent—we estimate about half—increased overseas through the export of coal from the US. There has been a large increase, over the same period of time that shale gas has become available to the US energy system, in exports of coal from the US. That coal is burnt overseas, so the net global emissions change is not as negative as it might be.

[407] **Professor Anderson:** If you think of it in terms of the global perspective, and if you want to think of shale gas as being lower carbon, you have to hold to the view that, by producing shale gas in the UK or elsewhere, somewhere else in the planet we will hold other fossil fuels in the ground. It is a reasonable position to hold that, if we produce shale gas in Wales, somewhere else in the world will hold coal, shale gas, ordinary gas or oil in the ground. If you think that we can hold to that position, you can hold the view that shale gas may be a lower carbon option. If you think that shale gas will be burnt in addition, as John says, to these other fuels, which I think is evidently the case, you cannot justify saying that shale gas is a low-carbon energy source. Also, I hasten to add that 75% of the molecular weight of shale gas is carbon. So, the language that you should use is that it is a less high-carbon fuel than some others, but it is still a high-carbon fuel.

[408] **William Powell:** I would like to ask you both for more information around the results of work that you have carried out on the potential impacts on renewable technologies and their viability in the development of shale gas, particularly on the impact of any particularly targeted tax regime, which was advocated by the potential shale-gas developers this morning.

[409] **Dr Broderick:** I am not aware of the announcements made this morning; I had not picked those up.

[410] **William Powell:** That was being advocated by previous witnesses this morning. There were no specific announcements. They said that that would be desirable for the development of that sector.

[411] **Dr Broderick:** I suspect that that is because the production costs of shale gas are on the high end and are fairly marginal. We have heard from geological research colleagues that the production costs in the USA are in the order of \$3 to \$4 per MBTU, but that the market price is only \$2. That low market price is, effectively, cross-subsidised by the production of liquids from shale wells. The gas is coming up and is produced as associated gas. So, the question about the viability of the industry in Europe, in terms of its ability to produce at a competitive market rate, is such that it makes sense for them to lobby for a favourable taxation regime.

[412] **William Powell:** If the sector was to successfully develop, what impact would it have on the viability of renewable technologies and on the overall climate of investor confidence in the renewables sector?

[413] **Professor Anderson:** It would be fair to say that you cannot give a categorical answer to the question of what exactly the position would be. However, you can postulate, or make reasonable assumptions, that if the energy industry is to invest a certain amount of money in future development, and if some of that money is spent on shale gas, it clearly cannot be spent somewhere else. So, unless there is additional money, any money that is spent on any technology that is not renewables, inevitably, has to be a shift away from renewables. So, unless there is some mechanism or structure in place that would encourage further investment in renewables, any investment in fossil fuels, of any sort, will be a displacement of investment in renewables.

[414] **Dr Broderick:** In terms of the specifics of the situation, if you imagined that the Royal Bank of Scotland, a nationalised bank that advertises itself as the oil-and-gas bank, was to change its portfolio to one that considered public costs and benefits, you could then see the potential for a displacement effect. We did some calculations on the capital cost estimates, which we provided in the evidence submitted. We looked at the investment that would be required to produce approximately 10% of the UK's current gas consumption, in terms of hydraulically fractured shale gas wells and the power stations that would burn that gas to generate electricity, including carbon capture and storage technology, if it becomes available on a commercial scale. We looked at the total cost of investment depending on what discount rate you choose: a commercial rate or a Treasury Green Book rate. That came to have a net present value of £19 billion to £31 billion. We then looked at the equivalent amount of renewable capacity, in terms of onshore or offshore wind, which you could realise with that same quantity of investment. The figures are presented in the table that we submitted to you, so I will not regurgitate that, except to say that the potential scale of the displacement is comparable to the 2020 ranges in the UK's renewable energy roadmap—so, in the order of 10 to 13 GW of onshore wind and 11 to 18 GW of offshore wind.

[415] **Vaughan Gething:** Following on from David Rees's point and the question of why not go for shale, I understand your answer that there is a global issue here in terms of carbon and climate change, but I want to look honestly at the position that the UK, as a whole, is in. We know that there is a consistent message about energy capacity coming offline in the next few years and what will replace it. At present, no-one is suggesting anything other than that most of that capacity will be replaced with generations of gas-fired power stations, and there is still an ongoing debate about nuclear.

[416] Is not the position that we are really in, and the reason why we are talking about shale and gas of any kind—whether imported or home-produced gas—about the failure of the renewables sector? Given that that has happened in the past, the country will have to make a decision now whether to ask, over the next two years, if we can massively increase the amount of renewable energy that we have, or are we not just going to have to accept that for a period of time, we will be burning more gas instead of coal and/or nuclear energy?

[417] **Professor Anderson:** You raised a lot of issues there, but much of that is a time frame issue. It will not be in the next few years. I do not know when you anticipate it. Let us take the nuclear one first. Even trying to get one nuclear station up and running between 2018 and 2020 will be a challenge, but do-able. If you were suggesting that we would have a suite of new nuclear plants up and running by 2020, no-one would accept that that was reasonable. So, we are talking about having a significant nuclear fleet after 2020 and, probably by 2030, you could have quite a number of nuclear stations. Gas could be much quicker, but if it is to be supplied by shale gas, that will still take quite a lot of time.

[418] So, to get significant supplies of shale gas out of the ground—the planning, drilling and exploring—will take a lot of time. It is unreasonable to expect that you would have significant quantities and new power stations online before 2018-20. All of the supply options take quite a long time. To assume that we can get gas up and running in the next two or three

years misunderstands the time frame issues. I think that that goes for all of the technologies.

[419] We keep talking about this shortage. There are some issues that we must address. However, we must address twenty-first century problems with a twenty-first century mindset. We still think of these as if they were in the twentieth century. There is currently roughly 80 GW of capacity—like 80 very large power stations—that are available to produce electricity in the UK. Our average consumption across the year is about 40 GW—half of that—and our peak is somewhere around 50 GW or 55 GW. So, there is still plenty of capacity in the system, even if we start to knock out some of these older stations. That is one thing to think about.

[420] The quickest thing, if we are really worried about the energy gap, is to reduce our energy consumption. That is much quicker than gas, nuclear and renewables. So, if we are very serious about the energy gap, we need to get our energy consumption down. I am sure that we are all aware that we are walking past £5, £10 and £50 notes on the floor, day in and day out. There are easy pickings there, in terms of energy consumption, but we are not picking them. So, if we are seriously worried about the energy gap, we need to think of it as a system and the first thing that we do is address the cheap, easy and quick part, which is energy demand. By and large, we have failed across the board to do that. Historically we have failed and we are failing at the moment. That is not to say that we should not think about the other supply options; we need to do that, but let us be clear and understand that they will all take a long time to put in place, and energy demand is much quicker. We have to think differently about the problem that we face today.

1.45 p.m.

[421] **Vaughan Gething:** Are you at all optimistic that, before 2020, we could have culturally changed the population of the UK in terms of the way it uses energy? I am genuinely being honest here, because if we think that we can change the way the population uses and demands energy supply, how we make use of it and retain energy, then that is not a great deal of time to change people's minds and attitudes to mean that we do not need a new generation of alternative power supply. Surely, that is an issue that we cannot avoid. We might want the country to change, and even if we give a very clear lead at our level and from other policy makers, are you optimistic that that would happen?

[422] **Professor Anderson:** I do not expect that putting labels on light switches that say 'switch off the lights when you leave the room', or trying to persuade people with adverts, albeit important, will make the change. It is a matter of standards and regulations. At the moment, we have a mindset across the UK and some other parts of the world that has prevailed for quite a lot of years, probably 10 to 20 years, that we do not like regulations. We prefer voluntary codes, prices, incentives, labels and information. That has broadly failed, as you suggest. Standards and regulations could be brought into place very quickly, which would drive us in a very different direction. For example, with domestic refrigeration, which is a very high energy-consuming part of the domestic sector in the UK, we are selling fridges that are A rated and which should not be sold in our shops. An A++ fridge will use between 40% and 60% less energy. We are not saying that the scrappage rate should be increased. If we just say, 'Change the standards by next year', very quickly, within four to eight years, you start to significantly change the amount of energy consumed in fridges. You can do that with lighting, as we are starting to do now, and you can do that across the board with all appliances. Indeed, you can do it with cars and most of the other things that we use that consume energy.

[423] The average that we use is usually very poor. There are technologies available across the board now that are much better and are available for sale at almost no price premium. We are not talking about new technology or having to spend money on research; these are already for sale in the shops, but we do not buy them. I think that we should put standards that would



drive us towards the technologies that already exist. That would be much quicker than any supply option. However, we need to do the supply options as well. First, we should be focusing on the easy hits. I accept the point that we have failed, historically, to do this, but we have only used labels, a few prices and some adverts, which I do not think is going to solve this problem.

[424] **Llyr Huws Gruffydd:** I wish to come back to the carbon capture and storage because it was referenced this morning as a good thing in this context when you come to justify the way that you handle emissions from fracking and other commercial gas sources. I just wanted you to expand on some of the comments that you made earlier, and some of the stuff that you have been saying in your evidence to us about the fact that it is untested on a large scale. I just wonder whether you think that that could be a serious or realistic proposition in the short to medium term.

[425] **Dr Broderick:** Carbon capture and storage is undoubtedly a very important technology globally. The question marks that we have raised are about the relevance to meeting the UK's 2 degrees C commitments. So, that is about the scale and the rapidity of change within the UK. The first thing that we would want to see bottomed out is the demonstration of commercial scale—a gigawatt scale—carbon capture and storage plants, and good measurements of the actual performance of those plants so that we have an idea of whether or not, or to what extent, they would be compatible with a decarbonised grid. We have to remember to consider that it is a grid that is being directed towards adopting heating and personal transport, which has the potential to treble or even quadruple the quantities of electricity that we will be requiring in the late 2020s to the 2030s.

[426] So, we have tried to get figures on the performance of CCS in terms of the greenhouse gas emissions per unit of electricity supplied to the grid. The best case that we can see from the actual on-site combustion emissions are in the order of 35g to 75g of carbon dioxide per kWh. That would potentially allow some use of CCS within the grid electricity system, but if you were to adhere to the CCC's recommendations of 50g average emissions per kWh of the grid by 2030, it could clearly not be the larger part of that. We have also raised concerns about the compatibility of the CCC's own budgets with a 2 degrees C guard rail in terms of avoiding dangerous climate change.

[427] Something else where we are only now coming to have good evidence in the academic literature is the matter of the life-cycle assessment of carbon capture and storage and the total quantities of emissions throughout its supply chain, not just those emissions attributed to the power station. There was a paper from Bath University last year that suggested that gas full life-cycle emissions would be around 80g of carbon dioxide per kWh, so it is quite clear that this is not a zero carbon technology, although it is certainly a lot lower than unabated gas.

[428] The other thing to note is that CCS has an energy penalty associated with it, because of the actual operation of the capturing devices, and so you multiply any additional emissions upstream. Even if you are capturing carbon dioxide in the plant, if you are requiring more gas to produce the amount of electricity, then you multiply anything in the transport, distribution and production of gas. In terms of hydraulic fracturing, it releases a methane on-site in the flow-back period following hydraulic fracturing that has the potential to add a substantial additional burden, and so we feel that there is the need for some research to combine the two to get the net grid emissions factor for shale gas plus CCS at some point in the future so that you would have an appreciation of what percentage—in the order of 10% of 15% to the national grid—could be supplied along those lines. We have an expert coming over from the National Renewable Energy Laboratory in the USA to visit us next week, and this is one of the issues that we will be trying to press him on, to see what work is coming out of the States on those two topics.

[429] **Professor Anderson:** Just to add to John's comments there, if we focus on the 2 degrees C that we have signed up to internationally, then the maths of this are very clear: even with carbon capture and storage, given that probably the best that we can get across the life cycle is somewhere around 80g of carbon per kWh generated—and that is still quite a lot of carbon—that is not compatible. Even if the text books were right, which they never are in reality—they are always slightly worse in practice—then we could not reconcile carbon capture and storage with shale gas or gas and our international 2 degrees C commitments. If you then look at what the Committee on Climate Change is suggesting to the UK Government, its targets are not the same ones that we have signed up to—they are significantly more lax than the targets we have signed up to internationally, but even there it would be very hard to see that there would be much scope for carbon capture and storage with gas.

[430] Again, part of this is a time issue. As John points out, this is an untested technology. We have tested the bits, but we have not put them together—not just in the UK, but globally. There are no large-scale global power stations that operate with carbon capture and storage. You would think that the first thing to do is to get one, and then to run it, or get a few, and run them for one to five years to test them, and then see how they work, and then make sure that, if they do work, the infrastructure is put in place, and then build the power stations and the structures to make that all work. That again will take considerable time, so if we do not get shale gas plants significantly running before 2020, it is hard to imagine that you would get significant carbon capture and storage until at least four or five years after that, and that would still be pushing the time frames. In the next 10 to 15 years, or certainly the next 10 years, it is hard to imagine that there would be significant contributions from shale gas for carbon capture and storage, and, even if there were, these would not be compatible with our international commitments on climate change.

[431] **Mick Antoniw:** My question has been answered.

[432] **David Rees:** You talk about shale gas, but do you have the same view on underground gasification?

[433] **Dr Broderick:** We have not done any specific research on underground gasification, but the broad point about additional fossil fuel production holds.

[434] **Professor Anderson:** Yes.

[435] **Dr Broderick:** Also, there is the point about upstream emissions being multiplied when you use carbon capture and storage on a plant because of the energy penalty. Those would be the two things that I would raise in reaction to that.

[436] **Professor Anderson:** There are still quite a lot of technical concerns about underground gasification, just to be able to maintain the gases where you want them to be, so that you have some control over them. There is a lot more work on that technology to be done, but even if it was as successful as carbon capture and storage in shale gas is anticipated to possibly be—even if it was that good—it would still suffer all the problems that we have laid out for shale gas in terms of its overall set of emissions being incompatible with our commitments and so forth.

[437] The difficulty here is that, at the end of the day, in a country as advanced as the UK or, in this case, Wales, given where we are on climate change and that we have done nothing in the last 13 or 14 years significantly to drive our emissions down, we face a very difficult challenge. Unless we want to renege on our commitments, we must have a virtually zero carbon energy supply, and that is not just for electricity. We are in a very difficult position

now, and these technologies cannot deliver what we need.

[438] **David Rees:** I would like to expand on that. Okay, I understand those points, and we are in a longer term position. It looks as though, from what you say, we will not hit the target anyway. However, if we as a country are trying to work towards those targets, is it a worthwhile exercise to look at using gas in the UK to take some of the coal-fired power stations out, knowing that other countries may not be doing the same as us, but that we as a country are taking that step forward?

[439] **Professor Anderson:** If you try to take the coal stations out, my first suggestion, again, would be to deal with the demand issue. Every time, it comes back to demand. If you can deal with the issue of demand, the next thing would be to say that the supply that we should be putting in place should be as low as possible, and that basically brings you to two options. Those options are nuclear and renewables. In the renewables, I would capture sustainably produced imported/exported biofuels—biomass—here. So, really, if we are serious about this issue, it is about getting the demand down and then focusing on the very low carbon options, which are basically nuclear and renewables.

[440] That is not to say that some of the poorer parts of the world will have to use shale gas and so forth, but of course, if we think that there is an equity dimension to this—again, we signed up to this at Camp David last year—then we have to accept the fact that the poorer parts of the world will see their emissions go up in the short term, to help their development and welfare issues. That will put additional pressure on countries such as the UK and Wales, where we have already benefited significantly from our use of fossil fuels and emissions. So, there is a very strong international equity dimension here that pushes us in particular ways on technologies. So, if we want to go down the shale gas route, we have to be really clear and say that we think that it is appropriate for countries like the UK and Wales, which have benefited from higher emissions in the past, to continue to have relatively high emissions, and that the other parts of the world will perhaps have to compensate for that or deal with greater levels of climate change. We need to be honest and direct about this.

[441] **Dr Broderick:** The other point to add on the matter of demand reduction and demand management is that, in the medium term, to facilitate a grid that has a large penetration of renewables, we are going to need a whole suite of supporting technologies as well. We cannot simply focus on the supply side of the grid equation. We need to think about the power electronics that facilitate new flows and new management regimes. We need to think about the new domestic technologies in heating and transport that give us new means of controlling the time of demand and the scale of demand. We need to think of bulk storage technologies that will enable the storage of renewably produced electricity for the periods when none is available. So, we need to stop focusing on single technologies, pitting one technology against another, and we need to stop focusing our attention solely on the supply of energy, by considering the transmission, distribution and management of energy. We have had it easy so far, because it is relatively easy to store fossil fuels. In future, we will need to be a lot more sophisticated about how we store and manage our energy system.

[442] **David Rees:** I am going off on a slight tangent, but should we also be looking at fuel cell storage mechanisms? The supply with some renewables is intermittent, and the demand comes at different times, so we need to look at how we store energy.

[443] **Professor Anderson:** It is a really important issue, this intermittency. First, it will remain an important issue, but I do not think that it is as serious as a lot of people suggest. Again, if we think of an intelligent energy system, with smart grids and all the things that you are probably quite familiar with, there certainly looks to be significant scope for allowing demand to move quite a lot, so rather than the supply necessarily always following the demand, quite a lot of the time, for things that we do not require urgently, the demand could

follow a slightly more intermittent supply.

2.00 p.m.

[444] In addition to that, we need to do more work on the storage options. There are other long-term options for supply, but we should seriously consider options like the Severn barrage or some tidal stream options. They are not intermittent in the same way, because we know exactly when they will produce their energy. While the moon is there, we know what will happen to tidal systems. We can then start to try to operate an electricity network to bring demand intermittency and these other options that are slightly different to intermittency, such as tidal schemes, together to make them work collectively. That is quite viable.

[445] If we are going to get more electrical domestic and industrial heating onto the grid, there are methods of doing that that may allow for more thermal storage within the heating system, depending on how you do that. Although the jury is out on this, if we are making vehicles more electric—I am thinking about private cars using batteries—there is some scope for moving electricity backwards and forwards between the batteries in the cars and back into the grid, depending on when they are plugged in. That requires a much more sophisticated way of seeing these sets of issues, but there is certainly a lot more scope for reducing the concerns that we may have from intermittency. That is not to say that there are not some concerns, but I think that it is possible to address most of these with a more sophisticated way of thinking about the energy system.

[446] **David Rees:** You have said that you want to change the climate to a situation that will improve the lives of our children and grandchildren, but, unfortunately, there is going to be an economic driver in this picture. You have highlighted that fact by what is happening in the United States where coal is still being extracted and exported. Therefore, is the greatest fear that the economic driver will dominate over anything else?

[447] **Professor Anderson:** The question of the economic driver is an interesting one. If I was the benevolent dictator of Wales, I would be asking ‘How do I make sure that it’s good for the economy?’, and by that I mean significantly good for aspects such as welfare and employment—the Welsh, by and large, take a much healthier view of the economy; it is not just about making money but about the wellbeing of the Welsh population. There are lots of options for retrofitting existing properties in Wales to get energy demand down. The Arbed and Arbed 2 schemes are good examples of what the Welsh Government has helped to drive forward. The energy demand, retrofit issue for houses and the employment issue can come together. These are very strong economic drivers for the Welsh Government to consider.

[448] So, there are ways to align the current economic and employment concerns that we have with what we need to do on the energy demand side. They align almost immediately, unlike the supply side, which will take a much longer time to put in place. The people who will benefit from the supply side—from constructing power stations in 2018 and 2020—may be Welsh people and people coming in from elsewhere, but we could be doing the retrofit agenda starting sometime this year. So, there is huge scope to align the economic and employment concerns that we very rightly have with the things that we can do to reduce our energy demand. Those things go together. From an economic perspective, a forward-thinking progressive Welsh Government will be rolling out schemes such as Arbed and those types of schemes, which have already proved to be quite successful.

[449] **Lord Elis-Thomas:** If we are looking for a benevolent dictator, Kevin, we know where to find you. [*Laughter.*] With regard to the research that you are in touch with on the areas of fracking in the United States, presumably what you were looking at was the effect of investment in unconventional gas on the investment in renewables, and the interface between the two. Those are the issues that you are pursuing, presumably?

[450] **Dr Broderick:** The topic that we were concerned about with our American colleague was the life-cycle assessment and the emissions through the supply chain. As far as I am aware, there has been quite substantial investment in renewables in the United States, but that has been supported by renewables-specific policies that have continued alongside shale gas. The question mark is about what happens in the future.

[451] **Lord Elis-Thomas:** Thank you. I see that there are no other further questions. We are very grateful to you for being available to us. Apologies for the contravention of Standing Orders in this session and for the failure to contact you properly and in an appropriate way, which is a matter for us here. If you have any experts in Manchester in multilingual channels in digital technology, which I am sure you do, I am sure that you can make them available to us. Thank you very much.

*Gohiriwyd y cyfarfod rhwng 2.06 p.m. a 2.08 p.m.  
The meeting adjourned between 2.06 p.m. and 2.08 p.m.*

### **Nwy Siâl a Nwyeiddio—Tystiolaeth gan Gyfeillion y Ddaear Shale Gas and Gasification—Evidence from Friends of the Earth**

[452] **Yr Arglwydd Elis-Thomas:** Croeso, Gareth, Naomi a Tony. Diolch yn fawr am ymuno â ni. Mae'r diwrnod heddiw'n codi o'n hymchwiliad blaenorol i ynni, i raddau, ac o'r ddeiseb a dderbyniwyd gan y Pwyllgor Deisebau. Rydym yn ffodus—rwy'n credu ein bod yn ffodus, beth bynnag—bod Cadeirydd y Pwyllgor Deisebau hefyd yn aelod o'r pwyllgor hwn, ac felly bydd gennym gyfraniad wrtho.

**Lord Elis-Thomas:** Welcome, Gareth, Naomi and Tony. Thank you for joining us. Today's proceedings arise from our previous inquiry on energy, to a certain extent, and also relates to a petition received by the Petitions Committee. We are fortunate—at least I think we are fortunate—that the Chair of the Petitions Committee is a member of this committee and, therefore, we will also hear a contribution from him.

[453] Diolch am eich tystiolaeth. Hoffwn ddechrau drwy ofyn beth yn union yw'r gofidiau penodol sydd gennych fel mudiad. Beth ydych chi'n credu y dylem, fel pwyllgor, ganolbwyntio arno wrth i ni baratoi ymateb i'r dystiolaeth rydym yn ei derbyn, gyda golwg arbennig ar agweddau polisi ynni Llywodraeth y Deyrnas Unedig, ac yn bwysicach i ni, polisi ynni Llywodraeth Cymru?

Thank you for your evidence. I would like to start by asking you exactly what specific concerns you have as an organisation. What do you think we, as a committee, should be concentrating on as we prepare a response to the evidence that we have received, in particular regarding the UK Government's energy policies, and, more importantly for us, the Welsh Government's energy policy?

[454] **Mr Clubb:** Bydd newid yn yr hinsawdd, fel rydych newydd glywed, yn broblem enfawr i'r byd. Mae goblygiadau dybryd arnom fel cymdeithas. Cred Cyfeillion y Ddaear Cymru bod yn rhaid i ni adael unrhyw danwydd ffosil nad ydym eisoes wedi ei dynnu o'r ddaear yn ei le, oherwydd nad oes digon o le yn y gyllideb nwyon tŷ gwydr i'n galluogi ni i ddefnyddio tanwydd ffosil bellach.

**Mr Clubb:** Climate change, as you have already heard, will be a massive problem for the world. There are serious implications for us as a society. Friends of the Earth Wales believes that we must leave any fossil fuels that we are not extracting at the moment where they are, because there is not enough room in the greenhouse gases budget to use fossil fuel any more.

[455] Dyna'r man cychwyn, ond rydym That is the starting point, but we also

hefyd yn cydnabod bod y pwyllgor hwn yn mynd i ystyried y mater ymhellach. Felly, hoffwn ddweud y dylid cael rhyw fath o ohiriad yng Nghymru o dan y gyfraith gynllunio oherwydd bod cymaint o bryderon ynghylch nwy anghonfensiynol. Felly, mae gennym sawl pryder uniongyrchol ynghylch y mathau gwahanol hyn o echdynnu nwy o'r ddaear. Mae rhai ohonynt ynghylch llygru dŵr dan ddaear ac eraill ynghylch y gallu strwythurol i reoleiddio'r diwydiannau hyn yn effeithiol. Er enghraifft, dim ond chwech o arolygwyr pyllau nwy llawn amser sydd gan yr Awdurdod Gweithredol Iechyd a Diogelwch. Yn ôl beth yr ydym yn ei ddeall, nid oes trwydded hyd yn oed yn bodoli ynghylch gadael llygredd o dan y strata daearegol. Mae hynny'n bryder i ni, yn ogystal ag a oes gan y diwydiant yswiriant i wneud yn iawn pe bai rhywbeth yn digwydd yn y pen draw i unrhyw wastraff—wedi'r cwbl, rydym yn sôn am ddatblygu cynaliadwy sy'n edrych yn bell i'r dyfodol.

[456] Mae pryderon hefyd ynghylch trafniadaeth. Rydym yn credu y bydd llawer o symudiadau lori, a fydd o bryder mawr i gymunedau lleol. Mae'n rhaid inni ystyried, er bod tipyn o brofiad o echdynnu nwy anghonfensiynol yn yr Unol Daleithiau, fod y rhannau hynny lle mae'r nwy yn cael ei echdynnu llawer yn llai poblog na'r rhan fwyaf o Gymru. Felly, mae pryderon mawr am hynny.

[457] Hoffwn ddyfynnu ein Prif Weinidog, Carwyn Jones, a ddywedodd dros flwyddyn yn ôl

[458] 'ei bod yn bwysig mabwysiadu dull gweithredu rhagofalus wrth archwilio neu ddrilio am ffynonellau newydd o danwydd.'

[459] Rydym yn cyd-fynd â theimladau Carwyn Jones yn hynny o beth.

[460] **Yr Arglwydd Elis-Thomas:** A yw teimladau'r Prif Weinidog yn parhau i fod yn bolisi Llywodraeth Cymru, hyd y gwyddoch chi?

[461] **Mr Clubb:** Efallai y gall Naomi ymhelaethu ar y pwynt hwnnw.

recognise that this committee is going to give the issue further consideration. Therefore, I would like to say that there should be some sort of moratorium in Wales under the planning law because there are so many concerns about unconventional gas. Therefore, we have many specific concerns about the different methods of extracting gas from the earth. Some relate to contaminating groundwater and we have concerns about the structural ability to regulate these industries effectively. For example, the Health and Safety Executive only has six full-time inspectors looking at gas. From what we understand, there is no licence in existence that relates to leaving contamination under the geological strata. That is a matter of concern for us, as is whether the industry has insurance to put right any damage that is done as a result of any pollution—after all, we are talking about sustainable development in looking to the very distant future.

There are also concerns about transport. We believe that there will be many lorry journeys, which will be a matter of huge concern for local communities. We have to consider too, even though the United States has a lot of experience of extracting unconventional gas, that those parts of the United States where gas is extracted are nowhere near as densely populated as most areas of Wales. Therefore, there are also major concerns there.

I would like to quote our First Minister, Carwyn Jones, who said over a year ago that

'it is important that where new sources of fuel are being examined and drilled for, a precautionary approach should be taken.'

We agree with Carwyn Jones's feelings in that regard.

**Lord Elis-Thomas:** Are the First Minister's feelings still reflected in current Welsh Government policy, to your knowledge?

**Mr Clubb:** Perhaps Naomi could expand on that particular point.

[462] **Ms Ludhe-Thompson:** I will speak in English, I am sorry. My Welsh is not good enough to speak about planning policy.

[463] Ymddiheuriadau am hynny. I apologise for that.

[464] **Lord Elis-Thomas:** It is good enough. I have had to relearn all the—[*Inaudible.*]

[465] **Ms Ludhe-Thompson:** Our point on planning policy is that if you look across planning policy in Wales—there is the minerals planning policy for Wales, the minerals technical advice note on aggregates, and the changes to ‘Planning Policy Wales’, the main edition—you will see that there is an inconsistent approach to the precautionary principle. Also, while there is quite a lot of detail on coal, for instance, there is not any detail on how planning officers and elected members at the local level should be dealing with unconventional gas applications—planning applications, for instance, for exploratory drills and associated activities. We think that that is a big gap and that it is important that there is clear guidance as to how to deal with these issues, because a number of issues arise. The problem with the exploratory drilling—as we have discovered in our work with communities in Lancashire at the moment—is that some of these projects are not coming under environmental impact assessment regulations. You have to remember that this is a novel technology.

2.15 p.m.

[466] We do not know enough about it at all. The environmental impact assessment is a way of finding out a lot more about what the possible impacts could be, but if you are not doing an environmental impact assessment you do not have access to that information. So, my feeling would be that planning officers who are dealing with these sorts of applications simply do not have access to the information that they need. The Welsh Government could do something very positive in looking at the suite of planning guidance that is available and at how the precautionary principles are treated, particularly in ‘Planning Policy Wales’, which deals with climate change issues and the precautionary principle. Under section 4.3 on principles in particular, where it states that the precautionary principles should be applied, if the precautionary principle is applied we suggest that it should be applied in a way that ensures that,

[467] ‘the planning authority is satisfied that all reasonable scientific doubt that there is any risk of adverse impacts including groundwater contamination has been eliminated’.

[468] We say this because we simply do not know at the moment what is going on. I think that we need to take a precautionary approach and be sure that we know what is actually being permitted and what is going on there. I think that my colleague Tony will be able to illustrate a few of the examples of why we need to take a precautionary approach.

[469] **Mr Bosworth:** There are several examples of why we need to take a precautionary approach. We can look at what has been happening in the US. We can start by looking at the potential impacts on the environment and human health from fracking and shale gas. The European Commission did a study last year, and it concluded that there were several areas that it would consider as high risk for human health in the environment that it talked about. It discussed water contamination, air pollution, water resource use, biodiversity impacts, traffic and noise all being potentially high-risk areas. Those are the sorts of reasons why I think we need to take a precautionary approach. The UK Government claims that the regulations that it is putting in place to manage the shale gas industry are fit for purpose, but our contention would be that those regulations, even if they are stronger than what is being applied in the US, where the industry has now been booming in the last decade, that will make the industry in the UK safer, but it cannot make it safe.

[470] **William Powell:** Could you give us some background to the moratorium that I understand is currently in place in France in relation to this technology? This came up in an earlier evidence session. Since that is something that you are seeking to bring about, while many of these other serious concerns have been addressed, I think that that would help the committee.

[471] **Mr Bosworth:** There is currently a moratorium in place in France. However, France is not the only place. Fracking is also currently banned in Bulgaria. There are also moratoriums in place in Holland, in North Rhine-Westphalia in Germany while it is awaiting further health studies, in the Fribourg canton of Switzerland, in some parts of Austria, and in several states of the US. The state of Vermont has banned fracking. There is also a moratorium in place in Québec. These are all countries and regions that have seen that fracking poses potentially great risks for the local environment, and they have either said, ‘We do not want this to be the route that we are going down in energy policy terms’, or, at the very least, they say, ‘We need to know a lot more before we can consider giving the go-ahead for fracking’.

[472] **William Powell:** That is helpful. What impacts do you see the potential development of fracking having upon the viability of the renewables sector in Wales and further afield that we are seeking as a country to develop? That is a theme that has also run through today’s sessions.

[473] **Mr Bosworth:** As you have been hearing from the Tyndall Centre, Friends of the Earth sees that our starting point is that, if we want to tackle climate change and cut our carbon emissions to tackle climate change, we have to be moving to an overwhelmingly renewable-based energy system. We have used the Department of Energy and Climate Change’s pathways model, which the Westminster department has produced, and our application of that model moves us to a system where we have 75% of our electricity produced from renewable sources by 2030. That is a challenging target. It is challenging, but it is achievable. As a footnote to that, I should add that on the quantities of renewables from different sources—that is, looking at offshore wind and onshore wind, wave, solar and tidal—where there is greater technological potential, we could go further; we have not gone as far as the technology will allow in setting the pathway for our future energy use. However, if we want to get down the pathway, we really need to go full throttle on renewable energy.

[474] We see the risk as being this: if we have a dash for gas, such as the Chancellor of the Exchequer is proposing at the moment, it will give a very confusing signal to the energy companies and to the people who are looking to invest in energy. A dash for gas is underpinned by the potential, we see, for shale gas in the UK. That is one of the things pushing the Chancellor towards that dash for gas. That confusion, which has been acknowledged, is not just the view of Friends of the Earth, because the Committee on Climate Change has said that the UK Government is apparently ambivalent about whether it wants a renewable energy future or a gas-based future. That is leading to uncertainty in decision making. Currently, there is only certainty about funding for renewables in the UK up to 2020, and if we want to get the renewables in place in the 2020s to meet our 2030 targets, we need that certainty now. However, while there is this potential for a dash for gas, rather than a wholehearted commitment to renewables, that uncertainty is going to continue.

[475] **William Powell:** That context is very helpful; thank you.

[476] **Mr Clubb:** Mae hefyd y pwynt **Mr Clubb:** There is also the point about the ynghylch y gystadleuaeth rhwng y cwmnïau competition between the renewable energy ynni adnewyddadwy am gyllid i brosiectau companies for funding for various projects. gwahanol. Mae Canolfan Tyndall wedi The Tyndall Centre has carried out some



gwneud ymchwil yn y maes a dod i'r casgliad, pe byddem yn dilyn trywydd nwy siâl, byddai'n cael effaith andwyol ar ynni adnewyddadwy ym Mhrydain ac felly yma yng Nghymru.

[477] Ar nodyn bach arall ynghylch Cymru, soniodd tystion cynharach heddiw am yr angen i newid i system ynni adnewyddadwy, ond bod hynny'n anymarferol neu'n amhosibl yn y tymor byr. Amcan Llywodraeth Cymru, wrth gwrs, yw creu dwywaith y trydan a ddefnyddiwyd gennym yn 2010 o ffynonellau adnewyddadwy erbyn 2025. Felly, mae amcan ym mholisi ynni Cymru i ddilyn y trywydd hwnnw. Nid oes dyfodol nad yw'n cael ei bweru 100% gan ynni adnewyddadwy. Po gyntaf yr ydym yn sylweddoli hynny a phenderfynu, 'Reit, mi awn ni am hwn nerth pob gewyn', gorau y bydd i'r boblogaeth, yr amgylchedd ac i swyddi a dyfodol datblygu cynaliadwy i Gymru.

[478] **Yr Arglwydd Elis-Thomas:** Cyn i mi alw David, mae gennyf bwynt. Fe gyflwynodd Gerwyn Llewellyn Williams, yn ei ddull dihafal arferol, ddadleuon dros ryw fath o adnewyddiad ynni drwy nwy confensiynol yn y lle cyntaf. Hynny yw, ynni o'r glofeydd y gorffennol yn cael eu drilio'n llorweddol i gael y nwy mas. Ni fyddai'n symud y cwmni tuag at ynni drwy ffracio hydrolig heblaw bod hynny'n cael ei brofi gam ymhellach i fod yn ymarferol. Beth yw eich ymateb i ddadleuon fel y rhai hynny?

[479] **Mr Clubb:** Gwyliais dystiolaeth y bore yma, a rhaid cyfaddef i mi deimlo bod ymatebion Gerwyn yn ddryslyd i raddau. Mi ffeindies i hi'n anodd iawn dod i unrhyw gasgliad ynghylch methan glo. A oes angen ffracio, wir? Dywedodd efallai y byddai angen ffracio yn y pen draw, ond yn ôl yr hyn yr ydym yn ei ddeall o ddarllen am y ffynhonnell ynni hon, rydym yn credu y bydd angen drilio ac wedyn ffracio i gael mwy a mwy o fethan, ac wedyn symud ymlaen. Dyma yw model busnes y cwmnïau hyn—maen nhw'n drilio mewn un man, wedyn yn symud ymlaen a symud ymlaen. Fel y dywedais yn gynharach, efallai bod hynny'n dderbyniol yn yr Unol Daleithiau, ond yng Nghymru, yn arbennig yn y lleoedd lle mae

research in this area and has reached the conclusion that if we were to follow the shale gas route, it would have a very detrimental effect on renewable energy in Britain and, therefore, here in Wales.

On another small note concerning Wales, earlier witnesses today mentioned the need to change to a renewable energy system, but that that is not practical or possible in the short term. The Welsh Government's objective, of course, is to create double the electricity we used in 2010 from renewable sources by 2025. So, there is a target under Wales's energy policy to go down that route. There is no future that is not powered 100% by renewable energy. The sooner we realise that and decide, 'Right, let's go for this with every ounce of energy that we have', the better it will be for the population, the environment and for jobs and the future of sustainable development in Wales.

**Lord Elis-Thomas:** Before I call David, I have a point. Gerwyn Llewellyn Williams, in his usual style, presented the arguments for some sort of renewal of energy from conventional gas in the first place. That is, energy generated from the former collieries by means of horizontal drilling to get the gas out. He would not move the company towards energy generated by hydraulic fracking without that having been further proven to be practical. What is your response to arguments such as those?

**Mr Clubb:** I watched this morning's evidence, and I must confess that I felt that Gerwyn's responses were rather confused. I found it very difficult to come to any conclusion about methane from coal. Do we need fracking, really? He said that perhaps we would eventually, but from what we understand from our reading around this source of energy, we believe that there will be a need for drilling and then fracking in order to extract more and more methane, and then move on. That is the business model of these companies—they drill in one area, then move on, drill elsewhere and move on. As I mentioned earlier, that might be acceptable in the United States, but in Wales, particularly in those areas where resources are available,

adnoddau ar gael, mae'r boblogaeth yn byw the population is dense and we do see  
 yn dynn iawn at ei gilydd, felly rydym yn problems because of that.  
 gweld problemau yn y fan honno.

[480] **David Rees:** To clarify a point on the MTAN, Naomi, did you say that it does not cover unconventional gas at the moment?

[481] **Ms Ludhe-Thompson:** We think that it is rather thin on the ground. If you look at the list of things in your technical advice note on coal, you will see that it talks about protecting areas of importance, reducing the impact of coal extraction, the local development plan, underground cold working, land and stability, stability of transport, water and mine gas, and it goes through all the issues. What you do not have for unconventional gas is a planning policy that talks about and goes through the issues.

[482] The other thing in here is that you have a lot of best practice. For unconventional sources of gas, where you are using very novel technologies, it is really important that you have research and development at the beginning so that you know what you are doing. We are finding that there are lots of unknowns about what is happening, what the impacts will be and how you manage that, because it is a new technology. That is one of the reasons why Gareth is talking about the moratorium, why Friends of the Earth is supportive of that and why so many other countries in Europe have taken that up, because it is a very pragmatic approach. You are basically saying that you want more information about what this is and what its impacts are before you say, 'Okay, fine'.

[483] At the planning application stage, what we are having is planning applications coming in and local authority officers, who may have never dealt with this kind of issue, having to deal with that. We think that that is a really big issue. It is the same for the statutory agencies. We have been looking at the environmental permit processes to do with mining waste water from the test drill sites in Lancashire. That is a hugely concerning issue, because there is no information on the chemicals used, what will come back, how much there will be and where it will be treated; there is a dearth of information. So, we are very concerned that it seems that we are not taking a precautionary approach to this, and that we need to be.

[484] **David Rees:** Okay, thanks for that. Gareth, you mentioned that fracking was inevitable, but if you look at the figures of this morning's witness—I think that he mentioned 1.65 billion cu ft of coal-bed methane, 1 trillion cu ft, and 49.87 billion cu ft for shale gas—that tells you what the economic argument is.

[485] Coming back to the shale gas issue or any unconventional gas, the European Commission study showed that lifecycle carbon emissions from shale gas, even in the worst case scenario, are significantly lower than coal. Would it not be better in the medium-term—I know your long-term position and your view on committing now to get there then—to look at gas as a medium-term temporary measure to get there? Are we really going to get there in the time that you want, or should we be looking at ways to reduce use and still move forward? I heard what the Tyndall Centre said earlier this afternoon about the offset costs as a consequence, but should we be looking at this as an intermediary step?

[486] **Mr Clubb:** Mae'r dystiolaeth sydd wedi dod ger ein bron o astudiaeth a gyllidwyd gan Co-op yn dangos bod nwy anghonfensiynol a nwy siâl yn yr Unol Daleithiau wedi disodli'r farchnad glo. Felly, mae allyriadau ym Mhrydain a gweddill Ewrop wedi cynyddu oherwydd bod glo wedi mynd lawr mewn pris, felly mae'n rhatach o **Mr Clubb:** The evidence that was provided by a study funded by the Co-op demonstrates that unconventional gas and shale gas in the United States have displaced the coal market. So, emissions in the UK and the rest of Europe have increased because the price of coal has gone down, so it is far cheaper for us to burn coal here than it is to burn gas. Last

lawer i ni losgi glo fan hyn nag ydyw i losgi nwy. Y llynedd, roedd glo yn gyfrifol am y rhan fwyaf o drydan a gynhyrchwyd ym Mhrydain, mwy nag ar unrhyw adeg ers y 1970au oherwydd bod nwy wedi disodli glo yn yr Unol Daleithiau. Efallai y bydd Tony eisiau ymhelaethu rhywfaint.

year, coal accounted for most of the electricity produced in Britain, more than at any time since the 1970s because gas has replaced coal in the United States. Perhaps Tony would like to elaborate on that.

2.30 p.m.

[487] **Mr Bosworth:** I do not know how much the Tyndall centre explained about its study; it assessed that the move from coal to shale gas has led to a cut in US emissions, but that is also partially down to an increased use of renewables in the US. The fact that they are using shale gas in the US has meant that the price of coal has fallen, which means that it has been exporting more, therefore it is being used more in other countries. The use of coal in the UK, as Gareth said, for electricity generation went up from, I think, about 25% at the end of 2011 to about 37% at the end of 2012. So, they are cutting down on the amount of coal that they are using in the US, but it is being burnt elsewhere. This poses the big challenge: is shale gas going to be burnt instead of coal, or is it going to be burnt as well as coal? At the global scale, until we have an international climate agreement, there is no way of ensuring that if certain parts of the world go for shale gas, that is going to be used instead of coal. If coal is going to be cheaper, then the coal will be burnt as well. We are in a world that has a hugely growing demand for energy.

[488] **David Rees:** Therefore, should we also be looking at reducing what we do in the UK, and by getting rid of coal and putting in shale gas, or any other unconventional gas, we would be making our effort? Until you get a global agreement, we cannot necessarily have an impact on what goes on elsewhere.

[489] **Mr Bosworth:** To a certain extent, the coal problem will be dealt with by the large combustion plant directive, which limits the amount of time for which coal plants can operate. The fact that they have burnt more over the last year, because of coal being cheaper, means that plants are spending more hours in operation and they are going to be shutting down relatively soon. To that extent, we will be moving away from coal anyway. The challenge is going to be whether we will have a system, as I said earlier, that will be based on continuing the use of gas, or whether we are going to say that, in the future, we have to be using renewables. That is what we have to be pushing for. We see a continuing role for gas in the electricity system up to 2030; there is going to be a need for some gas as a balancing mechanism to balance the renewables, but it must have a much-reduced role to what it has now.

[490] **David Rees:** You mentioned various other areas in Europe; North Rhine-Westphalia was quite an interesting one, considering its area of coal as well. Do they have, basically, a moratorium or are they looking at the scientific information, and how far down the line have they got with the scientific investigation?

[491] **Mr Bosworth:** As I understand it, the Government of North Rhine-Westphalia has said—I will check on this and I will be happy to send you an accurate note after the meeting—that it will not be giving permission for any shale gas extraction until it has done more studies on the environmental and human health impact. I believe that those studies are either just under way or about to start. In a similar case in Holland, they have said no more permits for shale gas and fracking until they have done similar studies.

[492] **Llyr Huws Gruffydd:** Hoffwn holi **Llyr Huws Gruffydd:** I would like to ask a ychydig ynglŷn â dŵr a'r *volume* o ddŵr little around the issue of water and the

sydd ei angen er mwyn delifro peth o'r dechnoleg yma a'r risg o halogi dŵr. Rydych chi wedi cyflwyno ystadegau yn eich tystiolaeth ynglŷn â faint o gemegau rydych yn gwybod sy'n cael eu defnyddio mewn ffracio yn yr Unol Daleithiau a'r gofidiau ynglŷn ag impact hynny ar iechyd pobl. Fodd bynnag, cawsom dystiolaeth wahanol iawn y bore yma a oedd yn awgrymu bod y cemegau a oedd yn cael eu defnyddio, neu y rhagwelwyd y byddent yn eu defnyddio, yn y wlad hon yn wahanol iawn. Felly, byddwn yn falch petaech yn ymhelaethu ar rai o'ch gofidiau chi o safbwynt dŵr.

[493] **Mr Clubb:** Yn ôl yr hyn rwy'n ei ddeall, nid oes unrhyw reoliadau sy'n dweud bod rhaid i gwmnïau ddatgan pa fath o gemegau maent yn eu defnyddio. Dim ond un cwmni sy'n ffracio ar hyn o bryd ac mae'r cwmni hwnnw wedi ei wneud yn glir pa gemegau mae'n eu defnyddio, oherwydd mae llygaid Prydain ar y cwmni hwnnw. Fodd bynnag, hoffwn weld dyletswydd statudol ar bob cwmni i ddatgelu pob cemegyn maent yn eu defnyddio mewn rhestr ar wefan cyhoeddus, ac na fydd hawl ganddynt i ddefnyddio cemegau sydd heb dderbyn trwydded gan gyfoeth naturiol Cymru, er enghraifft.

[494] **Mr Bosworth:** If I may just correct Gareth, the Environment Agency will be requiring the disclosure of all chemicals that will be used. However, I still do not think that that addresses the problem. They can tell you what is being used, but the problem is that, in the one place where fracking has been carried out so far, Cuadrilla, the company involved, told the Environment Agency what it was putting down the well, but the agency did not bother to check that what it said it was putting down the well was what actually went down the well.

[495] On what has been happening in the US, this is one issue that has been of huge concern. The challenge has been that the fracking industry is excluded from quite a bit of environmental regulation in the US, due to the Halliburton loophole, which was negotiated when various environment Acts went through around eight or nine years ago. Those excluded the fracking industry from federal regulation on clean water. This is an issue dealt with at state level and the information is quite patchy, but in one independent analysis that I have seen, where they looked at 353 chemicals that are known to be used in fracking, for which they did a risk assessment, they found that 25% of them were known carcinogens, 40% could affect the nervous system and 75% could affect the skin, eyes and respiratory system. So, there is a real problem with the chemicals that are being used. The industry will tell you not to worry because it is only half of 1% of the volume of water that it puts down, so it is next to nothing. However, it is using 4 million gallons of water each time it fracks a well on average in the US, and half of 1% of 4 million gallons is still 20,000 gallons of chemicals every time a well is fracked.

[496] **Llyr Huws Gruffydd:** Diolch, ac **Llyr Huws Gruffydd:** Thank you, and I am

volume of water that is needed to deliver some of this technology, and the risk of water contamination. You have presented statistics in your evidence regarding the amount of chemicals that you know are being used in fracking in the United States, and concerns relating to the impact of that on people's health. However, we had very different evidence this morning that suggested that the chemicals that were being used, or those that it was anticipated would be used, in this country are very different. So, I would appreciate it if you could elaborate on some of your concerns regarding water.

**Mr Clubb:** From what I understand, there are no regulations insisting that companies declare which chemicals they use. Only one company is fracking at present and that company has made it clear which chemicals it uses, because the eyes of Britain are upon it. However, I would like to see a statutory duty placed on every company to disclose every chemical that it uses in a list on a public website, and that they will not be permitted to use chemicals that have not been licensed by natural resources Wales, for example.

rwyf yn ymwybodol iawn o hyn; mae nifer o'r ystadegau yn eich papur. Yr awgrym a gafodd ei wneud y bore yma oedd na fyddai angen yr un cemegau fel rhan o'r broses yn y wlad hon. A oes gennych farn ar hynny?

quite aware of this; a number of the statistics are in your paper. The suggestion that was made this morning was that the same chemicals would not be needed as part of the process in this country. Do you have a view on that?

[497] Yr ail bwynt a gafodd ei wneud oedd bod y dirwedd reoleiddio yn wahanol iawn yn y wlad hon o'i chymharu â'r Unol Daleithiau ac na fyddai rhai o'r pethau sy'n digwydd yno—mae cyfeiriadau cyson at yr Unol Daleithiau—yn cael eu caniatáu yn y wlad hon.

The second point made was that the regulatory landscape is very different in this country, as compared with that of the United States. Some of the things that happen there—there is constant reference to the United States—would not be permitted in this country.

[498] **Mr Clubb:** Mae gennyf un pwynt i'w ychwanegu. Nid yn unig y cemegau sy'n mynd i lawr y twll sy'n bwysig, ond hefyd yr hyn sy'n dod yn ôl i fyny. Rydym yn gwybod bod rhywfaint o ymbelydredd yn dod i fyny. Gwnaeth tystion y bore yma hefyd sôn am goltar a benzene yn dod i fyny.

**Mr Clubb:** I have one point to add. It is not only the chemicals that go down the hole that are important, but also what comes back up. We know that some radiation emerges. The witnesses this morning also mentioned coal tar and benzene.

[499] Hoffwn hefyd gyfeirio at ddogfen dda iawn gan Asiantaeth yr Amgylchedd o'r enw, 'Underground, Under Threat', sy'n sôn am ddŵr daear. Mae'n dweud pe baech yn cael llygredd yn y dŵr ar arwyneb y ddaear, byddai'n cael ei glirio o fewn dyddiau neu wythnosau, ond pe bai hynny'n digwydd i'r dŵr daear, gallai'r un llygredd barhau am ddegawdau neu ganrifoedd. Unwaith eto, rydym yn sôn am ddatblygu cynaliadwy, a yw'n ddatblygiad derbyniol a beth yw'r risg. Os yw'r risg o lygredd yn parhau am ganrifoedd, a yw honno'n risg werth ei chymryd hyd nes ein bod yn gwbl sicr bod y dechnoleg sy'n cael ei defnyddio yn gwbl saff.

I would also like to refer to an excellent document from the Environment Agency, 'Underground, Under Threat', which covers groundwater. It states that if there were contamination of the water on the surface, it would be cleared in a matter of days or weeks, but if that happened to groundwater, that pollution could remain for decades or even centuries. Again, we are addressing sustainable development, whether it is an acceptable development and the risk. If the risk of pollution persists for a period of centuries, is that a risk worth taking until we are entirely sure that the technology used is completely safe.

[500] **Mr Bosworth:** Apologies for not answering your question directly. On the chemicals and whether the same ones will be used, I think that the bottom line is that we simply do not know. One reason why the companies wanted to keep this secret is because they use a different formulation of chemicals, depending on the geology and, so, we simply do not know which chemicals will be used in the UK. What Cuadrilla has used in Lancashire may be what is appropriate for Lancashire, but if fracking were to happen in south Wales, the chemicals used might be completely different.

[501] On the regulatory landscape, yes, it will be different in the UK from that of the US. That will undoubtedly be the case but, as I said before, regulation can make the industry safer, but it cannot make it safe. The problem is that we cannot say that the regulations will be fit-for-purpose for the simple reason that they have not been written yet. The Environment Agency has not yet produced even draft guidance on shale gas exploration; it has not yet started thinking about regulations and guidance on shale gas production. The Health and Safety Executive, which has the responsibility for the critical matter of well integrity, is

relying on offshore regulations and is not producing any new guidance for onshore. However, even if the regulation is stronger, that does not mean that there will not be any risk. The United Nations environment programme produced a document on fracking last year that said that fracking

[502] ‘may result in unavoidable environmental impacts even if UG is extracted properly’.

[503] It said that,

[504] ‘even if risk can be reduced theoretically, in practice many accidents due to leaky or malfunctioning equipment as well as bad practices are regularly occurring’.

[505] So, regulation can make the industry safer, but there is no way that it can guarantee that it will make it safe.

[506] **Ms Ludhe-Thompson:** I just wanted to add to that, if that is all right, on the environmental permitting process. Obviously, it is within the remit of the Environment Agency, and it has had a consultation on its draft permit documents for the activities on the wells in Lancashire. Essentially, they are extremely vague. No time frames are given for the life of the well. No exact quantities are given or understood for how much of the injected fracturing fluid remains below ground, and how much comes back up. There is the definite existence of naturally occurring radioactive materials, which obviously have to be dealt with at specific waste water treatment sites. There are a lot of issues about the well casing; I do not know whether you have talked about that. All the Environment Agency says in its draft decision document is that:

[507] ‘The well casing has been assessed, and we are satisfied that it will prevent any discharges to the groundwater strata’.

[508] There is just no evidence that it will be safe, and that it will remain. The evidence that we have from Preese Hall is that the drill was actually damaged. In terms of the regulatory landscape, it is extremely concerning that there seems to be this ‘everything will be okay’ attitude, even though there is no evidence to show that it is going to be okay.

[509] **Llyr Huws Gruffydd:** Mae gennyf un cwestiwn byr, jyst i gloi. Roeddwn yn sôn yn gynharach ynglŷn â'r *volume* o ddŵr a fydd yn cael eu defnyddio fel rhan o'r broses. A ydych yn ymwybodol o unrhyw astudiaethau sydd wedi cael eu gwneud ar yr effaith y byddai hynny'n cael ar argaeledd dŵr yn y wlad mewn cyffredinol? Rydym yn byw mewn cyfnod lle mae sychdwr a *hosepipe bans* ac yn y blaen, ac wedyn rydym yn sôn am ddefnyddio miliynau o alwyni o ddŵr i fynd ar ôl y dechnoleg hon.

**Llyr Huws Gruffydd:** I have one brief question to close. I mentioned earlier the volume of water that is being used as part of the process. Are you aware of any studies that have been undertaken on what impact that would have on general water availability in this country? We are living in a time when there are droughts and hosepipe bans and so on, and then we are talking about using millions of gallons of water in pursuit of this technology.

[510] **Mr Bosworth:** The Tyndall Centre has done some analysis of the volume of water needed at a national level. That says that it is not a huge problem. However, the Tyndall Centre does say that there could be significant problems at the regional level. For instance, in Lancashire, where Cuadrilla is fracking, the water is coming from the River Wyre catchment area, and all areas of that are either over-abstracted or under severe pressure. The position of the professional body, the Chartered Institute of Water and Environmental Management, is that shale gas extraction needs a lot of water, and it is concerned about the conflict between that use and the amount of water that is needed for the public supply or to maintain a healthy

environment. It does say that climate change scenarios predict less water availability in the future, so whether this level of water use is appropriate in the long term for energy production requires further research. There are definite problems. Wales could have problems. The south-east of England will definitely have problems if they go ahead with fracking there, because of the amount of water that is used—four million gallons a well, for however many wells, and however many times they are fracked.

[511] **Vaughan Gething:** I am very interested in what you are saying, and I want to ask you two particular points. We have gone through some of the points about fracking this morning as well. I am interested in your view, given what you have said about fracking, and the inherent and continuing dangers, and, in particular, points about the Environment Agency that I am sure we will take up when we get to speak to it about what really is in the waste water that comes back up and how much of it. Why do you think that the Energy and Climate Change Select Committee found no evidence that fracking produces a direct risk to ground water providing that the drilling well is constructed properly? It does not share your view at all, does it?

[512] **Mr Bosworth:** Sometimes you will hear the industry say that fracking produces no danger. It is very careful in its choice of words: it says ‘fracking’, by which it means the actual process of pumping the water down. However, it has been widely documented that there are problems with ground water contamination from other different aspects of the process. Fracking is just one part of the process. You can get problems with migration of water down naturally occurring fractures or via the extension of fractures that are created. That is possible with shale gas. It is more likely to happen with coal-bed methane because the depth is relatively shallow.

2.45 p.m.

[513] There are bigger problems, say, with things such as leaks via inadequately completed well casings—poorly formed well casings that subsequently fail. There is industry documentation that states that 6% of hydraulically fracked wells fail immediately, and 50% fail within 30 years. There is the additional problem that the leaks or spills over ground from transporting the fluid either to the site or transporting the waste water away from the site—

[514] **Vaughan Gething:** Are these industry documents from the industry in the US?

[515] **Mr Bosworth:** Yes, that is from Schlumberger, which is one of the leading fracking companies in the US.

[516] **Vaughan Gething:** Part of what was put to us today was, ‘Yes; there are big problems in the US, but the regulatory regime is entirely different’. I was quoting from the Energy and Climate Change Select Committee, so, it was a group of Members of Parliament saying, ‘Actually, properly constructed wells should—’

[517] **Lord Elis-Thomas:** Yes, but we are not guided by what Members of Parliament say. [*Laughter.*]

[518] **Vaughan Gething:** No, but that is not the industry. That is a group of different representatives coming to a conclusion and saying, ‘Actually, with properly constructed wells there should not be a ground water problem’. It is something that, around the table, we all have a concern about. I do not think that just talking about what has happened in the US will take us much further than saying, ‘There is a problem in the US’.

[519] **Mr Bosworth:** With respect, I think that we have to look at the US because that is the only place where fracking has actually been in operation to any great extent over the last

decade with the technological developments that have happened over the last decade. So, we have to look, to some extent, to the US as the example for the concerns that we need to have, the problems that can occur, and the measures that we need to be dealing with. There is clear evidence of problems of water contamination. I found a couple of examples when looking at this that have happened in the last two months alone. In Windsor in Colorado, 84,000 gallons of water contaminated with oil and chemicals used in fracking spilled from a broken wellhead. This was 500 yards from homes. It took 30 hours to stop the flow. So, there are real problems.

[520] **Vaughan Gething:** I do not think that there is any doubt that there is an issue with water contamination in some areas of operation; the point that I am trying to make is whether it is an inherent danger. I know that you talked about risk with Llyr earlier, but there is a danger in all forms of energy production and we accept and understand that. What I am interested in is whether it is something that is inherently there, that you cannot avoid, and any form of fracking, essentially, produces unacceptable environmental risk and/or damage, or is it that we need to consider the regulatory regime around it and that that could actually be a way to resolve some of those issues? That is what I am trying to get at: whether you accept that there is any way to make fracking acceptable or more acceptable.

[521] **Mr Bosworth:** My view is that there are inherent dangers with the technology that is being used here. You are using some highly toxic chemicals. You are pumping them underground. You do not know where they go when they are pumped underground. You have to deal with toxic waste water coming back up again. We are not sure whether we have the treatment plants to deal with that, we are not sure how the water will be stored until it is taken to the treatment plant, and we cannot guarantee that the tankers that are taking this toxic water to the treatment plants are not going to come off the road. It only takes one to come off the road and crash and you have a nasty incident there. There are some real inherent dangers. As I said before, I think that regulation certainly can make the industry safer, but it cannot make it safe. That is not just the view of Friends of the Earth. I was quoting before from the United Nations environment programme, and it would say that even if the industry is properly regulated you cannot rule out the problem of accidents and operator error and so on. The consequences of that could be enormous.

[522] **Vaughan Gething:** I want to move on to another line. It is something that I put to the Tyndall Centre. It is about where we are, and the honest choice. David Rees talked about this earlier, about the reality that, for a period of time, we are going to be stuck with gas. The Tyndall Centre's suggestion was that, actually, the future would not be 100% renewable, but the longer term future would be a mixture of nuclear and renewable energy. I am interested in the view that has been taken across UK Government policy: that gas will be here for much longer and that it is a desirable thing. The UK Government has set up—although I have not heard much more about it—the Office for Unconventional Gas and Oil. I am interested in whether you have had any contact with it, either directly or through colleagues, about what that office really is doing or when it will become operational, and whether you have a particular view on this other question that, given that we have not geared up the renewables sector at present, are we not stuck with gas for at least the next decade or more? Is that not the reality of where we are?

[523] **Mr Clubb:** Un peth y byddwn yn dweud yw er efallai bod polisi yn Lloegr yn mynd lawr y trywydd o ddefnyddio llawer iawn o nwy yn y dyfodol, ac, o ganlyniad i hynny, yn dilyn trywydd nwy siâl a phob math o nwy anghonfensiynol, yma yng Nghymru, mae gennym y cyfle o dan y gyfraith gynllunio sydd gyda ni i osod

**Mr Clubb:** One thing I would say is that although policy in England is going down the route of using much more gas in the future, and, as a result of that, is pursuing shale gas and all sorts of unconventional gases, here in Wales, we have an opportunity under our planning law to put a moratorium in place and we can wait; the gas is not going



moratoriwm a gallwn aros; nid yw'r nwy yn mynd i unman. Felly, yn y pendraw, wedi cael digon o dystiolaeth o safbwynt newid yr hinsawdd a'r hyn sy'n digwydd yn Lloegr, gallwn ddweud, 'Iawn, gallwn echdynnu rywffaint o'r nwy yma ac rydym yn gwybod bod y technegau yn ddigon diogel; iawn, gwnawn hynny yn y pendraw'. Fodd bynnag, yn fy marn i, mae'r risg ar hyn o bryd yn ormod a dylem fod yn defnyddio datganoli fel cyfle i ddysgu o beth sy'n digwydd dros y ffin.

anywhere. Therefore, at the end of the day, having had sufficient evidence in terms of climate change and about what is happening in England, we can say, 'Well, yes, we can extract some of this gas and we know that the techniques are sufficiently safe; fine, we can do that when the time comes.' However, in my opinion, the risk at present is too great and we should be using devolution as an opportunity to learn from what is happening over the border.

[524] **Vaughan Gething:** What about the next 10 years or so? Where are we going to be in terms of the balance between renewables and non-renewables? Is this not because we have not delivered, not just in Wales, but across the UK, on the most mature form of energy, because we cannot release planning permission quickly enough to gear up the renewable sector?

[525] **Mr Clubb:** Mae sawl rheswm, fel rydych yn gwybod, oherwydd eich bod wedi cynnal ymchwiliad i ynni a chynllunio. Byddwn yn cytuno bod problemau mewn sawl maes, ac mae cynllunio yn un ohonynt, ond mae'r rhain i gyd yn broblemau y gallwn eu datrys pe byddem yn canolbwyntio'n llwyr arnynt a ddim yn cael ein tynnu i ffwrdd o'r trywydd hwnnw i feddwl am bethau fel nwyon anghonfensiynol ac ynni niwclear. Yn ôl yr hyn y deallais o dystiolaeth Canolfan Tyndall, mae dau beth rydym yn mynd i ddibynnu arno yn y dyfodol—ynni niwclear neu ynni adnewyddadwy. Ni wnaeth ddatgan barn ar ba gymysgedd o'r technolegau hynny y byddai'n dymuno. O safbwynt y dyfodol, pe byddem yn ymrwymo'n llwyr i'r trywydd adnewyddadwy, o ystyried y bydd, yn y pendraw, rhyw fath o grid rhyngwladol, rhwng ynni'r haul o Ogledd Africa, ynni dŵr o Norwy ac yn y blaen, ac ynni tan ddaear o Wlad yr Iâ, bydd Ewrop gyfan yn hollol ddibynnol ar ynni adnewyddadwy, a byddai hynny yn rhywbeth dymunol.

**Mr Clubb:** There are a number of reasons, as you will know, because you have carried out an inquiry into energy and planning. I agree that there are problems in a number of areas, planning being one of them, but all of these are problems that could be overcome if we were to concentrate on them and were not diverted from that particular route to think about things such as unconventional gases and nuclear energy. From what I understood from the Tyndall Centre evidence, there are two things that we are going to be dependent on—nuclear energy or renewable energy. It did not express an opinion on what sort of mix of those technologies it would want to see. In terms of the future, if we were to commit ourselves entirely to renewable energy, bearing in mind that eventually there will be some sort of international grid in place, between solar energy from North Africa, hydro-energy from Norway and so on, and energy extracted from the ground in Iceland, the whole of Europe will be entirely dependent on renewable energy, that would be something that would be desirable.

[526] **Mr Bosworth:** I have one point to add to what Gareth said and then will go on to answer your point about the Office for Unconventional Gas and Oil. Gareth's view of what we need to be doing over the next 15 years is spot-on, but, as you have been hearing before, the other half of the equation is that, to get to the energy system we want, we have to do something about reducing demand. The cheapest and best form of energy solution is cutting how much we use, and that must be absolutely at the heart of what we do initially. It is not too late to do renewables, but we need to move quickly and provide the certainty for the investors and the people who want to provide the offshore wind, the onshore wind, who want to invest in wave and tidal power, solar and all those sorts of things. We need to provide that

investment certainty, but we need to do that quickly.

[527] On the Office for Unconventional Gas and Oil, I was talking to the Department of Energy and Climate Change only a couple of days ago about this. The office is still kicking off; it is having its initial stakeholder event on Monday, which I will be at, and it is still working out quite what its role is going to be. Tim Yeo, the chair of the Energy and Climate Change Committee asked the UK Energy Minister John Hayes whether he thought there was going to be a slight problem with the office being both a cheerleader and a regulator, and that is one of the challenges that that office is going to face.

[528] **Lord Elis-Thomas:** We have no problem with that in this committee.

[529] **David Rees:** I should have asked the Tyndall Centre this question. You have identified the fact that we need to look at how we can reduce demand. Do you have a breakdown of the proportion of domestic demand compared with industrial demand, so that can we have an idea of how that breaks down?

[530] **Mr Clubb:** Mae gennym yr **Mr Clubb:** We have the statistics for that in ystadegau am hynny yng Nghymru. O dop fy Wales. I cannot remember them off the top of mhen, nid wyf yn medru cofio, ond mae'r my head, but we have that evidence and I am dystiolaeth honno gennym ni ac rwy'n hapus happy to send it to you. i'w hanfon atoch chi.

[531] Hoffwn ychwanegu bod ein defnydd I wish to add that our use of electricity and o drydan a nwy yng Nghymru wedi mynd i gas has gone down 25% since 2005, so we lawr 25% ers 2005, felly rydym yn defnyddio are using significantly less electricity and gas sylweddol lai o drydan a nwy nag yr oeddem than we were just some six years ago. That ddim ond rhyw chwe blynedd yn ôl. pattern began quite a long time before the recession, so there is a very significant trend Dechreuodd y patrwm hwnnw ymhell cyn y of reducing our use of gas and electricity. dirwasgiad, felly mae tuedd sylweddol iawn o leihau ein defnydd o nwy a thrydan.

[532] **Russell George:** There seem to be two parts to the evidence that we have received, namely the emissions and the dangers associated with them. On the emissions, I feel that we have had balanced evidence, but, on the dangers, I think that Tony said three or four times that regulation can make fracking safer, but not safe. That has been quite a theme in your evidence, and there has also been some talk about the risks associated with health. On the other hand, there are bodies of evidence that have found that there is no danger in fracking. I receive bodies of evidence all the time on forms of renewable energy that show associated health risks, dangers and uncertainties, and which state that there should be moratoriums on forms of renewable energy. I would have thought that there is general acceptance among us all that there will always be an element of risk, health risk, danger or uncertainty related to every form of energy, whether it is renewable or not.

[533] I got the impression from what you are suggesting that there should be a moratorium until all risks are eliminated with regard to fracking, and that it should be completely safe with no associated health risk at all. What are your observations on that?

[534] **Mr Clubb:** Rydym wedi cynnig yn **Mr Clubb:** In our evidence we propose what ein tystiolaeth yr hyn rydym yn credu y dylai we believe should be in the planning system, fod yn y system gynllunio, sef namely

[535] 'Planning permission for unconventional gas operations...will not be granted unless the planning authority is satisfied that all reasonable scientific doubt that there is any risk of adverse impacts including groundwater contamination has been eliminated; the proposal will

not compromise the planning authority's duties in relation to climate change mitigation and adaptation; and the proposal is environmentally acceptable, or it can be made so by planning conditions or obligations.

[536] Nid wyf yn credu bod hynny'n dweud, 'Mae'n rhaid i'r broses fod 100% yn ddiogel', achos, fel rydych yn ei ddweud, ni allwn warantu y bydd popeth 100% yn ddiogel. Fodd bynnag, rydym yn dweud y dylai fod system o reoleiddio gweddol dynn i wneud yn siŵr bod y diwydiant hwn yn ymddwyn mewn ffordd sydd yn parchu'r amgylchedd, pobl leol a'r gymdeithas y mae'n gweithredu ynddi.

I do not think that that equates to saying, 'The process must be 100% safe', because, as you say, we cannot guarantee that something will be 100% safe. However, we are saying that there should be a system of relatively tight regulation to ensure that this industry behaves in a way that respects the environment, local people and the society in which it operates.

[537] **Ms Ludhe-Thompson:** To add to that, in looking at the evidence that was given this morning, particularly the written evidence in the documentation, I could not find any references to evidence or studies; there are no footnotes. However, our evidence references proper studies, reports and academics who have participated in proper studies. I just wanted to bring that to your attention.

[538] **Yr Arglwydd Elis-Thomas:** Diolch yn fawr ichi. Cyn i mi gau'r sesiwn, hoffwn nodi bod y prif waith rydym wedi ymwneud ag ef heddiw yn dilyn o'n hadroddiad ar ynni a chynllunio. Rydym wedi canolbwyntio'n bennaf ar wahanol ddulliau o gynhyrchu ynni o nwyon, gan roi blaenoriaeth arbennig i nwyon anghonfensiynol. Fodd bynnag, rydym hefyd wedi cael tystiolaeth werthfawr iawn gan ganolfan Tyndall, y mae Prifysgol Caerdydd yn gysylltiedig â hi, ar bwysigrwydd rhoi blaenoriaeth i holl gwestiwn defnydd. Byddwn yn sicr yn edrych ar hynny.

**Lord Elis-Thomas:** Thank you. Before I close the session, I wish to note that the main work in which we have engaged today follows on from our report on energy and planning. We have concentrated mainly on various methods of generating energy from gases, with a focus on unconventional gases. However, we have also received valuable evidence from the Tyndall centre, with which Cardiff University is associated, on the importance of prioritising the whole question of use. We will certainly be looking at that.

3.00 p.m.

[539] Yn y canol, fel tamaid o gaws yn y *sandwich* cawsom gyfoeth naturiol Cymru. Felly, rydym wedi cael diwrnod eithaf defnyddiol o waith. Roeddwn am bwysleisio ein bod yn y broses o ymwneud â chi fel rhanddeiliaid. Rydym yn gwerthfawrogi eich tystiolaeth fel ffordd o barhau i fod yn gyfeillion beirniadol i'r Llywodraeth ac i bolisi ynni Cymru, gan graffu'n gyson ar yr hyn sy'n digwydd. Yn yr ysbryd hwnnw, rwyf am gyfeirio nôl at argymhelliad 77 o'n hadroddiad ar ynni a chynllunio, lle gwnaethom argymell y dylai

In the middle, like a piece of cheese in a sandwich, we had natural resources Wales. So, we have had quite a useful day of work. I would like to emphasise that we are in this process of involving you as stakeholders. We appreciate your evidence as a means of continuing to be critical friends of the Government and of Welsh energy policy, by scrutinising it regularly. In that vein, I would like to go back to recommendation 77 of our report on energy policy and planning, where we recommended that

[540] 'Llywodraeth Cymru weithio gyda Llywodraeth y DU a'r gweinyddiaethau datganoledig eraill i lunio canllawiau

'The Welsh Government should work with the UK Government and the other devolved administrations to produce technical guidance

technegol ar ffurf Nodyn Cyngor Technegol newydd i helpu awdurdodau cynllunio lleol yng Nghymru i ymdrin â cheisiadau cynllunio ar gyfer chwilio am nwy anghonfensiynol a'i echdynnu, gan gynnwys ceisiadau lle cynigir defnyddio ffracio hydrologig'.

in the form of a new Technical Advice Note to help local planning authorities in Wales in dealing with planning applications for the exploration and extraction of unconventional gas, including applications where the use of hydraulic fracturing is proposed'.

[541] Derbyniwyd yr argymhelliad hwnnw mewn egwyddor ond—rwy'n dweud hyn yn benodol wrth Naomi—dywedodd y Llywodraeth:

That recommendation was accepted in principle but—and I say this specifically to Naomi—the Government said:

[542] 'Nid ydym o anghenraid yn argyhoeddedig fod y materion yn ddigon gwahanol i gyfiawnhau Nodyn Cyngor Technegol newydd'.

'We are not necessarily convinced however that the issues are sufficiently distinct to justify a new Technical Advice Note'.

[543] Felly, byddai diddordeb gennyf yn yr ymateb i hynny gennych chi, fel y gallwn drafod ymhellach ymateb y Llywodraeth a cheisio ei pherswadio y byddai'n briodol i wneud nodyn cyngor technegol newydd. Wrth gwrs, rwy'n meddwl bod yn rhaid inni symud oddi wrth y nodiadau technegol hyn am fod y rhain yn rhan o hen bolisi cynllunio'r Deyrnas Unedig. Rwyf am weld cyfundrefn llawer mwy gweithredol ac ymarferol. Down at hynny yn nes ymlaen pan fyddwn yn trafod y Bil cynllunio. Nid wyf am roi fy hun allan o drefn drwy beidio â bod yn ddiuedd yn y gadair heddiw. [Chwerthin.]

Therefore, I would be interested in hearing a response to that from you, so that we can discuss further the Government's response and try to persuade it that it would be appropriate to draw up a new technical advice note. Of course, I think that we need to move away from this regime of technical advice notes because they form part of old UK planning policies. I want to see a far more functional and practical system in place. We will broach that issue later when we address the planning Bill. I should not say anything that is out of order by not being unbiased in the chair today. [Laughter.]

[544] Will Members please contain themselves?

[545] Hoffwn edrych ar y cwestiwn a ddylem fod yn ceisio perswadio'r Llywodraeth i gael dull newydd o gynllunio.

I would like to look at this question of whether we should be endeavouring to persuade the Government to take a new approach to planning.

[546] Rydych wedi gofyn inni ystyried un mater pwysig arall, sef y cwestiwn o foratoriwm neu atalfa ar y math hwn o ddatblygiad, a phwysigrwydd yr egwyddor na ddylid rhoi caniatâd i ddatblygiad oni bai bod pob gofal ac ystyriaeth wedi cael ei gymryd o'r effeithiau. Felly, byddwn yn ystyried hynny fel un o'n hargymhellion posibl. Yn amlwg, byddai diddordeb gennym mewn cael ein cyfeirio at y dadleuon rhyngwladol mewn llefydd eraill sydd wedi dilyn llwybr fel hwn. Rwy'n ddiolchgar i Tony am ein cyfeirio. Rydym newydd fod yn edrych ar wyneb hawddgar Prif Weinidog Nordrhein-

You have asked us to consider another important issue, namely this question of a moratorium on this sort of development, and the importance of this principle that consent should not be given to development unless all care and consideration has been taken of all possible impacts. Therefore, we will consider that as a possible recommendation. If you could refer us to any international precedent in other places that have gone down this road, then that would certainly be of use to us. I am grateful to Tony for making those references. We have been looking at the amiable face of the Minister-President of Nordrhein-

Westfalen. Mae ef yn Weinidog gwyrdd ac mae hynny'n siŵr o fod yn help o ran y penderfyniad sydd wedi digwydd yn y fan honno.

Westfalen. He is a green Minister and I am sure that that assists in the decisions taken there.

[547] Diolch yn fawr iawn ichi am eich tystiolaeth ac am eich presenoldeb. Fel rwy'n dweud o hyd wrth y pwyllgor hwn, nid yw'r pwyllgor hwn ond cystal â chyfraniad ei randdeiliaid. Diolch yn fawr.

Thank you very much for your evidence and your attendance today. As I tell the committee regularly, this committee is only as strong as the contribution of its stakeholders. Thank you very much.

*Daeth y cyfarfod i ben am 3.04 p.m.  
The meeting ended at 3.04 p.m.*