



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

**Y Pwyllgor Cynaliadwyedd  
The Sustainability Committee**

**Dydd Iau, 15 Mai 2008  
Thursday, 15 May 2008**

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cynhwysir cyfieithiad Saesneg o gyfraniadau yn y Gymraeg.

These proceedings are reported in the language in which they were spoken in the committee.  
In addition, an English translation of Welsh speeches is included.

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

Lorraine Barrett	Llafur Labour
Michael German	Democratiaid Rhyddfrydol Cymru (Cadeirydd Dros Dro y Pwyllgor) Welsh Liberal Democrats (Temporary Committee Chair)
Lesley Griffiths	Llafur Labour
Alun Ffred Jones	Plaid Cymru The Party of Wales
Darren Millar	Ceidwadwyr Cymreig Welsh Conservatives
Brynle Williams	Ceidwadwyr Cymreig Welsh Conservatives
Leanne Wood	Plaid Cymru The Party of Wales

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

Paul Allen	Cyfarwyddwr Datblygu, Y Ganolfan Dechnoleg Amgen Development Director, Centre for Alternative Technology
Peter Harper	Pennaeth Ymchwil ac Arloesedd, Y Ganolfan Dechnoleg Amgen Head of Research and Innovation, Centre for Alternative Technology
Tim Helweg-Larsen	Cyfarwyddwr y Ganolfan Amgen er budd y Cyhoedd, Y Ganolfan Dechnoleg Amgen Director, Public Interest Research Centre, Centre for Alternative Technology
David Hood	Ymgynghorydd a Pheiriannydd, Y Ganolfan Dechnoleg Amgen Consultant and Engineer, Centre for Alternative Technology

**Swyddogion Gwasanaeth Seneddol y Cynulliad yn bresennol**  
**Assembly Parliamentary Service officials in attendance**

Joanne Clinton	Dirprwy Glerc Deputy Clerk
Dr Virginia Hawkins	Clerc Clerk

*Cynhaliwyd y cyfarfod yn y Ganolfan Dechnoleg Amgen, Machynlleth.*  
*The meeting was held at the Centre for Alternative Technology in Machynlleth.*

*Dechreuodd y cyfarfod am 2.31 p.m.*  
*The meeting began at 2.31 p.m.*

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

[1] **Michael German:** Good morning, and welcome to the Sustainability Committee's first formal meeting outside Cardiff bay, and welcome to the Centre for Alternative

Technology here in Machynlleth, in its Straw Bale Theatre. I am deeply grateful to the centre for its hospitality in housing this meeting.

[2] I am, as usual, obliged to make a number of housekeeping announcements. The first is that there is a slightly different procedure than normal for sound reinforcement. There is an on/off switch on the side of the headset, which will give you the translation should any Member or witness give a presentation through the medium of Welsh.

[3] Please ensure that all electronic devices are switched off, as they interfere with the broadcasting equipment; I will issue a £10 fine to Members whose telephones ring in the middle of meetings, to be donated to a charity of my nomination.

[4] We have received apologies for today's meeting from Alun Davies and Karen Sinclair.

2.32 p.m.

**Ymchwiliad i Leihau Allyriadau Carbon yng Nghymru: Sesiwn Dystiolaeth ar  
Ynni Adnewyddadwy a Meicrogynhyrchu  
Inquiry into Carbon Reduction in Wales: Evidence Session on Renewable  
Energy and Microgeneration**

[5] **Michael German:** We will now hear evidence from the Centre for Alternative Technology in relation to renewable energy and microgeneration, as part of the energy production section of our inquiry into carbon reduction in Wales. We will also receive an update on Zero Carbon Britain, the alternative energy strategy, from the Centre for Alternative Technology, which is item 3 on our agenda.

[6] I welcome to the meeting Paul Allen, who is the development director for the Centre for Alternative Technology, Peter Harper, who is head of research and innovation, and David Hood, who is a consultant engineer for the centre. I will give you three minutes to introduce the centre's perspective on renewable energy, so that Members will have time to put some questions to you afterwards. Who wants to go first?

[7] **Mr Hood:** I will go first. Do I have to push the microphone button?

[8] **Michael German:** No. Sorry, I should have said to Members and everyone else that there is no need to push any buttons. It is all done as if by magic.

[9] **Mr Hood:** Thank you all for coming here so that we can discuss this topic with you. Renewable energy is required for our sustainable development and our long-term energy security in Wales. We are lucky in that we have one of the largest renewable energy resources of any country in Europe: we are blessed with a large amount of wind, marine, wave and hydro resources, as well as huge amounts of biomass potential. That means that we are in the ideal position to make full use of these resources to help to meet our sustainability, carbon reduction and energy security targets. The renewable energy systems that have been used in Wales to date have been quite successful, but there is massive scope for increasing the level and the diversity of the systems in place. What is needed is large-scale support for these schemes, for instance, from the Welsh Assembly Government, to promote their accessibility to householders, community groups, businesses and on a national level, so that we can help to increase the penetration and diversity of these systems across Wales.

[10] **Mr Allen:** The challenge is not so much a technology challenge, because we have a lot of technologies that are technically and market mature; the challenge is really to do with

training people from all walks of life—public servants, local authorities, headteachers, and so on—to be aware of the benefits, financially and environmentally, that renewable energy can bring, on all of its different scales, from microgeneration to large offshore projects. We do not feel that that level of training is happening fast enough.

[11] **Mr Harper:** As someone who lives in Wales, I would love to see Wales being a generous net exporter of energy to the rest of the United Kingdom and to the world. There is a great tendency in the environmental field for people to consider how they can get away with doing the minimum and hoping that other people will sort out these problems. However, as Dave said, because Wales is blessed with great resources, we ought to find ways of giving them. Every area, whether it is a small region within Wales or the whole of Wales, should consider how it can be a net exporter and how it can give more than it receives. We should promote that throughout Wales.

[12] **Michael German:** Thank you very much. Lorraine will kick off with the first questions.

[13] **Lorraine Barrett:** Would any of the panel like to tell us what challenges Wales faces in reducing carbon dioxide emissions from energy production, and how these challenges can be overcome?

[14] **Mr Allen:** First, we have to be aware of the incredible resource that we have. If you look at a renewable energy map of Europe, you will see that Wales is the Saudi Arabia of green electricity—we are most well endowed with it. However, we must also ensure that we are not just importing the technologies, and that we are not just bringing in Mitsubishi or Danish wind turbines. To gain the full economic benefit, we also need to look at manufacturing our turbines here. What we are seeing is that the demand for renewable energy technologies generally is far exceeding the supply, because of the incredible rises that we have seen in the barrel price of oil. So, if we are not to become dependent upon that, the more we can get indigenous renewable systems manufactured, the better the economic benefits in the long term. Those are important factors.

[15] **Mr Harper:** I have something to say that may be unpleasant: we have to bite the bullet about coal. There is a fundamental contradiction in the Assembly Government's policy: you cannot have a genuine decarbonisation programme and a significant coal production industry at the same time. You cannot do that. We have to find a way around that. I know that it is politically difficult, but we have to do it.

[16] **Lorraine Barrett:** Could you give us your view on the timescale in which Wales and the UK as a whole should be responding to the challenges—if it is not already too late—for achieving substantial carbon emission reductions from energy?

[17] **Mr Harper:** It depends on who you are listening to and where you get your original data. We are just looking at the latest climate science, which comes from climate scientists all over the world. There is a pretty good consensus about that, and it is much quicker than we were led to believe. We have to go very quickly. However, it is difficult for one part of Great Britain to do it alone; indeed, it is difficult for Great Britain itself to do it alone. For one country to decarbonise and bear the costs and difficulties of that while no-one else does it does not make any sense at all. So, to some extent, everything hangs on the post-Kyoto world. When the Kyoto protocol runs out in 2012, we need a much tougher worldwide treaty to replace it. That is not very far away. Although lots of people are working on it, it does not look as though we are really on track for that. We, at the Centre for Alternative Technology, feel that we should all be preparing for that post-2012 world, when there has to be a massive worldwide decarbonisation programme. If that does not happen, it makes no sense for Wales to go it alone. Whatever we can do to help that worldwide process will be an important part of

our work.

2.40 p.m.

[18] **Michael German:** Before I ask Brynle to come in, I want to go back to the issue of coal, which you raised earlier. What would you say to those who claim that the new desulphurisation procedures make coal a much cleaner form of energy than it was in the past?

[19] **Mr Hood:** The desulphurisation process, as you say, is for reducing the amount of sulphur dioxide produced by a coal-fired power station, and does nothing to reduce or mitigate the amount of carbon dioxide being produced by it. Its primary role is to prevent acid rain. What we are looking at is the problem of burning coal, the huge amounts of carbon dioxide that are released from that, and the massive contribution to global warming as a result of burning that coal. Currently, we have no technical solutions that we can implement. The projects for carbon capture and sequestration are still many years away from technical fruition, so, until those technologies are fully proven and viable, there are no clean ways of burning coal in a climate where we have climate change as a big issue. It is just not a feasible method of going forward.

[20] **Leanne Wood:** I fully understand the points that you are making about coal, but the UK Government's response to this appears to be to turn to nuclear power. Would you like to say something about that?

[21] **Mr Allen:** One challenge that we face in solving the problems that are in front of us is to get a robust international consensus on what we do about climate change. If the UK Government builds new nuclear power stations as a response to climate change, while forbidding or restricting the access of other nations of the world to the same technology, viewed from a non-western point of view, that would be a very difficult position for the Foreign and Commonwealth Office to maintain. In addition, nuclear power has proved to be more expensive than planned, as construction costs go up and so on. Mrs Thatcher was enthused to build one nuclear plant a year, and she stopped after the first one. It is an expensive technology. If you compare nuclear and coal, you see that they are both finite resources that will deplete. As you go into the depletion of uranium, you would be dealing with less rich ore, so the cost of enriching it goes up. As you go back into coal, the supply of coal will also deplete, and it will become harder to extract it from the seams and so the costs will go up.

[22] If we go for our indigenous renewable resource for Wales with real vigour and commitment, it will be there every year, in perpetuity. I can see that as being the best investment for Wales. For jobs and manufacturing, if we can get that working back down the supply chain for research and academia, we could be talking about a massive Welsh renewable programme on the scale of an Apollo programme. We could link public awareness, academic research, manufacturing and public programmes into one programme, and there is a massive amount of energy that we could harvest.

[23] **Brynle Williams:** Do you consider that the current renewable energy targets in Wales and the UK provide an appropriate response to the challenges of climate control and security of supply?

[24] **Mr Allen:** If we look back over the past 15 or 20 years, we find that the evidence for the severity of climate change was developing all the time. We have been through a quantum leap in the past seven years, when we have realised that our emissions are really just the detonator. The main trigger of climate change is the feedbacks that start to occur within natural climate systems. As the earth warms, the Siberian permafrost melts, which releases huge amounts of methane, or if we lose the polar ice, it alters the reflectivity of the earth,

which means that the earth absorbs more. If we get to the point at which we go into the positive feedbacks within natural systems, the economic consequences of that will be enormous, as the Stern review ably pointed out. The most important thing is that we keep our political decision-makers up to speed with the latest climate science, for them to decide whether the measures are enough to meet the challenge.

[25] **Darren Millar:** You mentioned the positive feedbacks, the tipping point at which global warming continues feeding itself indefinitely, no matter what we do to try to reduce carbon emissions, with the climate getting increasingly hotter. Do you think that we have reached that stage and, if we have not, when do you think we will and how will we know that we have reached it?

[26] **Mr Allen:** It is difficult to say, because you will only know with hindsight when you have crossed the line, but, for the latest evidence, I suggest that you read the report, 'Climate Code Red' produced by the Carbon Equity group or look at the intriguing report produced by Hansen from the NASA Goddard Institute for Space Sciences.

[27] Since the fourth assessment report of the Intergovernmental Panel on Climate Change closed for evidence at the beginning of 2006, we have had a lot of hard evidence on how polar ice melts. Fissuring occurs and water pours down the fissures, lubricating the ice and causing it to shift. We need to update the IPCC report with that latest evidence. It looks like we have a matter of 10 years to make a big turnaround in our attitude.

[28] **Darren Millar:** For the record, there have been many recent news items that seem to produce evidence that, over the past 10 years, global temperatures have not increased significantly and have plateaued for the time being. Do you accept that evidence and, if so, what does it tell us about climate change?

[29] **Mr Allen:** I think that you have to look at a lot of evidence from a lot of scientists, because there will always be one particular scientist who will move in a particular direction. Taking the fourth assessment report of the Intergovernmental Panel on Climate Change as a meridian of where science is, it says that this is serious and directly relates to us and our emissions.

[30] **Brynle Williams:** What make-up or mix of renewable energy do you believe is necessary to help Wales reach its target? What do you think is the best way to achieve this mix?

[31] **Mr Allen:** The majority of the energy that Wales has to capture is off shore, through marine wind and tidal streams and the best way of capturing it is through a clear, economic strategy such as a long-term feed-in tariff, whereby business and industry know that they will get a premium price for renewable energy and that that is guaranteed over a long enough timescale that businesses are prepared to invest in the manufacturing and capability to meet those targets. We do not want a constantly changing economic motivator that will go up and down, with which we get an entirely different system with a different name because business will just throw its hands up and say, 'We cannot deal with this.'

[32] **Alun Ffred Jones:** Er gwaetha'r ffaith bod technoleg ynni o wynt wedi datblygu'n helaeth ar hyd a lled y byd, mae dadleuon yn parhau ei fod yn annibynadwy a'i fod yn creu difrod i'r tir, os ydych yn codi melinau gwynt ar y tir, a'i bod yn ffordd aneffeithiol a drud iawn o gynhyrchu trydan. A oes gennyhch unrhyw olwg ar hynny yn y

**Alun Ffred Jones:** Despite the fact that energy from wind technology has been developed substantially throughout the world, it continues to be argued that wind energy is not dependable, that it harms the land, if the windmills are erected on land, and is an ineffective and expensive way of producing electricity. Do you have a view about that in

ganolfan?

the centre?

[33] **Mr Allen:** One of the major expenses in developing wind energy is dealing with planning and getting planning permission and the complexities and uncertainties involved in getting planning permission. That should be made easier and more straightforward. However, there is also a strong role for the bodies that look after the countryside to work much more closely with the developers to ensure that the proposals that are put forward are not proposed in the wrong places so that we do not invest in proposals that will be rejected, but work together with the developers to get the right renewables in the right places. However, in terms of its carbon capture, we would be paying back the fossil fuels used to manufacture and install a wind turbine within a year of its operation. Conventional fuel prices are rising, but the price of wind energy is not rising, although the price of steel to manufacture turbines is. If that can be Welsh steel and Welsh manufacturing, then that economic benefit goes back to Wales. However, many of the concerns go back to the early days of wind power, where it was presented as a landscape intrusion; if people perceive it in that way now, and feel that it will affect their property values, that causes a lot of public resistance, which has not happened in other countries.

2.50 p.m.

[34] **Brynle Williams:** Going on from that, do we place too much emphasis on wind alone, without looking at other alternatives? In your opening remarks, you used a brilliant phrase, namely that we are the Saudi Arabia of green electricity. I wonder, as I travel up and down Wales, whether we are doing enough with hydro power. One of the other major problems is that we have waste, such as human waste, and we do not seem to be putting enough emphasis on making use of it; I am talking about bio-digesters. Am I right to assume that? Should you as professional people be pushing this more? I am not being insulting, gentlemen, but it seems that everyone is focused on wind, and we are not looking at a healthy mix of everything.

[35] **Mr Hood:** Wind is one of the technologies that is most commonly talked about, because it is quite polarising. It is popular in business, because it is cost-effective now. It is easily deployed, and is an already-developed technology. It is something that people quite easily catalyse for or against.

[36] On technologies such as hydro technology, we actually have a large amount of hydro power in Wales, but because it is, in many respects, a much more subtle technology—it is not as visually intrusive, and there is much less public concern over it—you hear much less about it. That does not mean that there is not as much going on, it just means that people make less of an issue about it. The big problem with hydro technology is that, because we have been doing it for a long while, many of the sites that are potentially suitable on land—the rivers and the dams that have been put in place—are already in place, so there is not that much scope for expansion. There are quite a few small, previously used post-National-Grid sites for hydro power, which we are happily putting back into use.

[37] In terms of the more modern, more development-orientated technologies, such as bio-digesters, and the use of biomass, we should certainly be looking into those areas, because this is a huge resource that we have. I suppose that what it needs is that push, to raise its profile, as well as investment in the additional research and funding of pilot projects, to raise their profile to the level of technologies such as wind.

[38] **Mr Harper:** They are two completely different domains. If you are talking about the present situation, present economics, present policies, and so on, that is a different world to talking about a serious effort to decarbonise Britain. If we were to go down that route, it would be completely different, and we would not be talking about just a few little windmills



here, and some biogas digesters there—it would be a complete transformation of the Welsh economy, and that would be a different game. Therefore, we need to keep these two things separate—are we talking about what we are trying to do now, under the present rules, or are we thinking about something completely different? Sometimes, those two get a bit confused.

[39] **Brynle Williams:** Zero Carbon Britain outlines the renewable energy mix in Britain. How would this mix look in Wales if the Welsh Assembly Government were to aim for a zero carbon Wales?

[40] **Mr Allen:** It would look very exciting. Many of the renewable energy resources are on the Welsh coast, where population is, relatively, less, therefore carbon per capita is less. As I said, we have the potential to become a net clean, green renewable energy exporter into England, and into Europe.

[41] **Leanne Wood:** What is your view of the proposals for the Severn barrage?

[42] **Mr Allen:** We are right to ask the question, but I think that the question should probably not be, ‘Should we or should we not build this barrage on the Severn?’, but rather, ‘Looking at the amount of energy in the Severn estuary, what technologies are available, such as tidal lagoons, in particular, that could capture that energy with the minimum impact on biodiversity, while getting the maximum replicability in other estuaries, such as the Dyfi estuary?’. If we can prove that tidal lagoons work, they would be much more replicable than a barrage. It should not be a case of saying ‘yes’ or ‘no’ to this; we should be saying, ‘There is the energy; let’s work with the Royal Society for the Protection of Birds and the Countryside Council for Wales to come up with the best technology in order to get the most out of that energy so that we can kick-start an industry that can be replicated in other parts of Wales as well’.

[43] **Michael German:** To follow that through, if the lagoon required a wall that is 10 times longer to produce the same amount of energy, which is what has been recently suggested, would you say that that is a satisfactory alternative, or would you say that if you are going to have lagoons that produce a smaller amount of energy you would have to spread your resources around the British coast?

[44] **Mr Allen:** I think that we might have to spread our resources to other parts of the British coast.

[45] **Mr Harper:** If you have a set of different technologies that you are comparing in terms of different factors, you must look at the whole thing very carefully and work out whether, in some cases, you might be going backwards in carbon terms. We must compare these things carefully. It could be that, in the end, some kind of tidal barrage, on balance, is accepted as a kind of emergency measure in terms of the situation in which we find ourselves.

[46] **Michael German:** Do you want to come back on that, Leanne?

[47] **Leanne Wood:** I am just interested that you are advocating the lagoons, or investment for research into them.

[48] **Mr Allen:** The comparison between the barrage and a lagoon should be put out for further research.

[49] **Darren Millar:** What about tidal stream technology in the Severn estuary? That is becoming increasingly viable and is much cheaper now than it ever has been. It overcomes a lot of the technological problems that there would be with the corrosion of the turbines, for example. Do you think that that is a viable alternative that should be considered? It is

certainly something that can be replicated much easier.

[50] **Mr Allen:** It would not necessarily be an alternative to a barrage or a lagoon, but it could be an additional technology. The example that I would give you is that back in the early 1980s when the larger-scale onshore wind generators were being proven, the Danes developed that whole market and a very strong industry. So, as the rest of the European Union developed and understood the necessity for wind turbines, the Danes had the product with the proven track record and so we ended up importing Danish technology. We can see far enough ahead to know from the climate and energy security data that we have that these technologies will be important. If we develop the Welsh home market and the manufacturing and skills, it will be a very important export technology.

[51] I would also add that as we consider the current Welsh economy—with some trepidation about stagflation or recession—a major Government-supported and Assembly-supported build programme to manufacture renewables could kick-start the Welsh economy out of this crunch that it seems to be going through at the moment.

[52] **Alun Ffred Jones:** Bu i chi gyfeirio yn eich cyflwyniad at y ffaith bod angen amrywiaeth o ynni adnewyddadwy. Mae ynni o wynt wedi ei ddatblygu fel ein bod yn ei ddeall yn eithaf da ac yn gweld y manteision a'r anfanteision. Fodd bynnag, mae technoleg llif y llanw, y cyfeiriodd Darren ato, yn ymddangos i mi yn eithaf amrwd ac mae'n ymdebygu i beiriannau Heath Robinson. A gytunwch â hynny? Ai ym maes biomas y credwch y dylem chwilio am y datblygiad mawr nesaf?

**Alun Ffred Jones:** You referred in your presentation to the fact that we need different types of renewable energy. Wind energy has been developed to the point at which we understand it quite well and see the pros and cons. However, it seems to me that tidal stream technology, which Darren referred to, is quite raw and a bit like a Heath Robinson contraption. Do you agree with that? Should we be looking for the next major development in the area of biomass?

3.00 p.m.

[53] **Mr Allen:** We must look at several technologies. I do not think that it is an either/or question. There has been a lot of concern about trying to grow crops to produce fuels to keep the transport fleet on the road, for example. If you look at the figures for the land area that is needed and the impact on wildlife, that is no good. Certainly, there is a lot of potential to utilise forest-residue product more fully, but that should not detract from the research into tidal stream technology, because we know for certain that the energy is there. It is basic mechanical engineering; no new nuclear fission process has to be proven—it is hard engineering. We know that people are now talking about paying \$200 a barrel for oil within the next 18 months. So, we should develop the technologies now while we have a relatively stable energy price; we do not know what will happen to the world energy price as India, Asia and China grow their demand for energy and as the Saudis begin to plateau their output. It is a good investment in the future. We need a strategic overview of the research that is going on in Wales and of how we relate bringing a technology to technical maturity and ensuring that that links well with bringing it to market maturity, so that it is a clear path all the way.

[54] **Mr Harper:** We would like to ask the Assembly Government what powers it has to accelerate research. Research takes a long time to carry out, and it takes resources. This is usually done at UK level or by commercial companies and so on. We feel that a great deal of research is necessary, because so many questions are coming up, such as whether tidal stream is a Mickey Mouse technology and whether biomass or lagoons are reasonable. Who knows? We do not know enough about these things; we are not carrying out the research. We need to carry out a great deal of research to make the right technical choices, and, as a nation—that is, the whole of the UK—we are not doing that. I would like to see Wales taking a lead here, but

I do not know what powers we have to accelerate that.

[55] **Mr Allen:** At the same time, we may be spending a significant amount of money on research that does not directly answer the urgent questions at hand. So, perhaps it is not that we need more money for research, but that we need to strategically re-purpose our research investment.

[56] **Mr Hood:** I have one final point on wave technologies. In Britain, the Government financed the wave hub initiative, so that it could trial and demonstrate a series of near-mature wave technologies. In Wales, we have enough locations and sufficient diversity of marine situations, particularly for tidal stream, tidal flow and tidal barrage, to become a test centre and a world leader in these technologies, so that people would come to us to see what is possible and what is being done. If you want to be able to promote those technologies, that is the type of thing that you need, namely to take an equivalent of the wave hub model and repeat it here.

[57] **Michael German:** Thank you. Brynle, do you want to come in?

[58] **Brynle Williams:** That is all right, he has answered what I wanted to ask.

[59] **Darren Miller:** We have covered some of the area that I wanted to touch upon. We were talking about larger schemes there, but returning to microgeneration, which you touched on earlier in your opening remarks, David, one of its perceived problems is the payback time, particularly for individual households that might want to invest in microgeneration technology, especially photovoltaic technology, for example, which is expensive at the moment. What can be done to change that in order to overcome the price barrier? You have already mentioned rising energy costs, which make the alternatives look more appealing, but the payback time for something such as photovoltaic technology will still be significantly longer than, for example, a turbine, which people may find unattractive. How do you think that we can overcome those barriers?

[60] **Mr Hood:** The problem is to do with accessibility of information. There is a large amount of information available to people about a whole range of technologies, but what is not available is a system whereby people can find out what is suitable for them as householders. If you want to reduce your energy bills and your carbon emissions, you need to know what the most cost-effective thing for you to do is. You might well find that putting photovoltaic cells on your house is not the most suitable thing for you; it is much more likely to be insulating your property as much as possible, installing a thermal system or upgrading your boiler. These may be far more cost-effective and beneficial steps than installing a photovoltaic system.

[61] So, the Welsh Assembly Government needs a system of providing impartial and unbiased information to people so that they know what they should be looking at, whether they should be spending all this money on a photovoltaic system or whether something else would be a better route. With regard to bringing the costs down for householders, if they know what the most suitable thing is for them, we can have a series of grants, low-interest loans or feed-in tariffs, depending on the technologies.

[62] **Darren Millar:** You touched on feed-in tariffs, which would guarantee a return on someone's investment. What do you think of community-type schemes, where you might have a street of people contributing to the cost of something in the area to get the benefit for themselves?

[63] **Mr Hood:** In general, the returns for a community of people on an investment in one large system in the best possible location for it are considerably better than if they were to buy

10 or 50 small systems and install them in their buildings. The problem is that there are few incentives and many hurdles to overcome with community renewable energy systems. In England, they have recently launched a community sustainable energy programme, but that is open only to community groups in England. There is no similar system for community groups in Wales to access funding—it just does not exist. Whereas in Scotland and in England community groups can access money to assess feasibility and then to help with the installation of these technologies, there is nothing in this country to match that, and that is a massive hurdle to overcome.

[64] **Darren Millar:** Would you suggest that the Welsh Assembly Government might offer such an incentive?

[65] **Mr Hood:** Exactly.

[66] **Michael German:** Can I just ask you to hang on to that point until I come to my last question? You may want to reflect on that.

[67] **Mr Allen:** I would add that if you take up microgeneration systems such as solar water heating, which is technically mature and time-proven, the most cost-effective way to implement them is to fit them when you build the houses. You can fit 30 while the scaffolding is up and you are putting the roof on. Unless that happens then, you have missed the opportunity for the most economic installation.

[68] **Brynle Williams:** You would advocate or support the view that we have to legislate on this matter, would you? It is a point that we came across in Austria. Regrettably, we do not have this system, but you would advocate that we go down this route, would you?

[69] **Mr Allen:** Yes. There is an enormous amount to be gained by looking at the best practice of real-life systems from across the EU and replicating them—picking and choosing all the best things and making them all happen in Wales.

[70] **Alun Ffred Jones:** Yr oeddwn am ofyn am y tariffau 'bwydo', ond mae pawb wedi sôn eu bod yn bethau da.

**Alun Ffred Jones:** I was going to ask about the feed-in tariffs, but everyone is of the opinion that they are a good thing.

[71] Soniodd Darren am y cynlluniau gwresogi cymunedol. Aethom i Awstria Uchaf yn ddiweddar, lle y mae 450 o gynlluniau eisoes ar waith—mae llawer o goed yn Awstria. Mae wedi gweld hynny'n ffordd o hyrwyddo economi ffermydd hefyd. Gan fy mod wedi siarad â David ynghynt, gwn eich bod yn sefydlu system wresogi biomas yma yn y ganolfan. Os deallais yn iawn, yr ydych yn canolbwyntio ar ddefnyddio'r gwres yn gyntaf yn hytrach na chynhyrchu trydan. Pam ydych yn dilyn y llwybr hwnnw?

Darren mentioned the community heating schemes. We went to Upper Austria recently, where there are some 450 schemes already operating—there is a lot of forest in Austria. It has seen that as a means of promoting farm economies as well. As David and I have already spoken, I know that you are establishing a biomass heating system here in the centre. If I understand it correctly, you are concentrating on using the heat first instead of electricity production. Why are you going down that route?

[72] **Mr Hood:** In our research on our new biomass combined heat and power plant, we are attempting to test different operating methods, ideally to make the best possible use of the resource that we have. If you run a combined heat and power plant to generate electricity, typically you are then producing more heat than you require. What we want to do with that, as we have a centre with large heat and electricity demands, is to assess which is the most

practical and efficient method of running this over a period of years, with the possibility for replicating that in community schemes across Wales.

3.10 p.m.

[73] There is massive scope for this type of system—these community heating or even combined heat and power schemes. However, as Paul says, with the solar thermal systems, it is more cost-effective to work on that from the start. New developments and housing groups need to have this recommended to them at the point of design to make it cost-effective. Then there are ways that we can concentrate the efficiency of the systems.

[74] **Mr Harper:** It is worth adding that, as well as the system that we are putting in here, there is a businessman on the other side of the Dulais valley who is putting in an absolutely identical system, but for a completely different purpose, which is interesting. He is trying to make higher quality forestry products, so he has a use for the heat in the system, which he uses for kiln-drying the timber, and then he can sell the electricity into the grid. So, here is a model for farmers everywhere—if he can do it, lots of other people can do it too. We are looking forward to seeing how it works.

[75] **Darren Millar:** Going back to our visit to Austria and some of the lessons that we learned, one of the things that that Government was doing in order to prime the pump for delivering community heating schemes was to purchase the heat and energy from the schemes, guaranteeing an income to any potential investors. Do you think that that is something that the Welsh Assembly Government might want to consider, perhaps instructing local government that all public buildings, for example, should source their energy from such schemes, particularly in off-mains gas areas?

[76] **Mr Allen:** Yes. It would be an exciting survey to look at the total energy purchase of public buildings in Wales and how that can best be married with local generation.

[77] **Michael German:** I will just reflect for a moment on the feed-in tariffs. I have heard it said that the German system of feed-in tariffs is extremely complex. Is there an easy way of establishing feed-in tariffs that can be well understood by the public, without costing the public purse huge amounts of money?

[78] **Mr Allen:** I would say that the German system has proved itself to be effective in using significant amounts of renewables—it is well ahead of other EU countries. I would not rule out anything because of complexity; a laptop computer is incredibly complex, but it can be made easy to use. There are lessons about pros and cons to be learned from Germany, but we are in a complex situation, and we need to learn from the systems that are working in the EU and replicate them here.

[79] **Mr Hood:** The German model—which is only one of a huge variety around the world—is complex, but the nice thing about it is that you can choose which technologies you most want to support. So, you can balance the system and encourage different technologies to come forward. Although that makes it more complicated for the producers, and there is a more complicated tariff to come to terms with, it is very clear in the minds of the public—because the funding comes from a tax that everyone pays. That is clearly labelled on your electricity bill, so every householder knows how much they are contributing towards green electricity. If you ask someone in this country about the nature of the renewables obligation certificate, they will look at you completely blankly, because nobody—even people in the industry—can explain it well. The simplicity of the German model is that everyone who gets an electricity bill knows how that money is being used—they know what happens to it. So, I agree that elements of the German model are complex, but the beauty of it is the level of public participation and understanding, and people are more supportive because of that.

[80] **Lesley Griffiths:** I would like to look at Welsh Assembly Government energy policies. Do you think that enough emphasis is placed on carbon reduction through low-carbon energy production?

[81] **Mr Allen:** We are heartened by the enthusiasm that Jane Davidson has brought to the table, but I think that, if you were to compare that with the most recent climate science and the sense of urgency that is coming through scientists, we have to look at accelerating what we have in that regard, but doing it in such a way that maximises the economic returns for Wales. So, we are heartened by what we see, but there is more that can be done. In particular, we must go beyond just thinking of energy efficiency to think of a whole new approach to how we use energy and how energy is used to deliver wellbeing. During the foot and mouth disease crisis, we found that we were exporting and importing almost identical amounts of lamb between Wales and the member states of the EU. I talked to Will Lloyd Williams, the local butcher, and he does not want to sell his lamb to Italy—he wants to sell his lamb to people in Welshpool. So, we want some type of market indicators that enable the market to see the carbon, because the market system, whether you like it or not, delivers a lot of what we enjoy, but it is essentially driven by the lowest cost options, and it is carbon-blind. We need to find some way of reforming the market through thinking again about how we tax—taxing carbon rather than labour or value, perhaps—or about forming tradable energy quarters that the market players need to bid for. In that way, the carbon becomes visible to the market, so the lowest carbon option gives you the economic advantage. That would use the engine of the market to drive us out of carbon, instead of driving us further into carbon, which, from a Welsh perspective, with the renewable resources and the food production potential that we have, could work very well for us.

[82] **Brynle Williams:** It was interesting recently to see that some supermarket packaging was helping us out on this issue; the packaging showed the carbon footprint of a particular product. That is what you want: supermarkets hopefully getting that message across for us. That is just an observation.

[83] **Lesley Griffiths:** To what extent do you feel that the Welsh Assembly Government has been successful in utilising the powers available to it in order to reduce carbon dioxide emissions from energy production?

[84] **Mr Allen:** Well—

[85] **Alun Ffred Jones:** I think that that is the answer.

[86] **Mr Allen:** I think that we can see the vision. For example, if we look at something such as the strategic search areas for technical advice note 8 and the whole TAN 8 process, we can see the vision and the targets, but we are not meeting our own targets in terms of the amount of renewables that were planned to be installed under TAN 8. We constantly say to elected officials that, assuming that your programme worked 100 per cent, does that get us to the point where Sir John Houghton feels relaxed about life? We have to ensure that, if the programme works 100 per cent—not everything does—it gets us to where we need to be.

[87] This is why we welcome the initiative of the Climate Change Commission that the Assembly has set up. I often find that it is my role to present the most serious climate science in whatever committees I am involved with, but the opening presentation by Dr Kevin Anderson from the Tyndall Centre for Climate Change Research woke people up to the serious situation that we are in. We are sitting shoulder to shoulder with the unions, the Confederation for British Industry and the public sector, so I think that the Climate Change Commission is a very good initiative. If the Assembly is asking organisations to be a critical friend, it must be welcoming of the criticism that is received. It is also necessary to build a

vision of exactly what needs to be done outside the limits of political acceptability, so that we have a plan for zero carbon Wales, and we would love to work with the Assembly to pull out a zero carbon Britain, so that we know what needs to be done. It would not be a case of criticising particular policies, because we can say, ‘This is what needs to happen; over to you guys who are in power’.

3.20 p.m.

[88] **Mr Harper:** It is easy for you to hide behind the limitations in the powers that you have, but, occasionally, you have given us a surprise. It is interesting that, in Zero Carbon Britain, we called for zero carbon buildings by 2012, only to be upstaged by the Assembly Government’s target of 2011. [*Laughter.*] So, you can do it. Sometimes you roll up your sleeves and you do it. That is to be recommended.

[89] **Mr Allen:** I suppose that I would say that, if Wales is seeking to gain more jurisdiction over the things that happen in Wales, having a good record on delivering on urgent matters such as climate change makes a very good case for those powers being devolved.

[90] **Lesley Griffiths:** If specific carbon dioxide emission targets are to be set for Wales, should they be sub-divided into shares by sector? If so, what share of the total should reductions as a result of energy production comprise?

[91] **Mr Allen:** I do not have the exact answer to that question in my head but I am sure that it can be calculated. I think that it has to be by sector, because we can look at where we are now and see how we have to make reductions every year. The Climate Change Bill is looking at 3 per cent and the evidence is telling us that it has to be more than 3 per cent, but we have to share that over the different sectors equally and we have to recognise that some of the carbon reduction technologies are more appropriate for some sectors than others. It is not the end point that we need to look at, I suppose; it is the area under the curve—the amount of carbon that we have left to use that gets us to where we need to be. So, we have to ensure that we adopt the quick gains and that we do not miss out on the lower-hanging fruit.

[92] **Lesley Griffiths:** But you believe that it would have to be done by sector?

[93] **Mr Allen:** I can see the advantage in doing that, yes.

[94] **Leanne Wood:** How much would it cost to implement a zero carbon Wales and what would the environmental benefits be?

[95] **Mr Allen:** We have to recognise that we are entering a future of very uncertain energy prices. I read financial reports produced early last year by Cable News Network and reports from other accredited climate sources that said that oil would not reach \$100 a barrel, and now people are talking about \$200 a barrel. If we are to do what we need to do now, the period over the next five years, when we have a relatively stable energy price, is the most cost-effective time in which we could ever do it. It is never going to be cheaper to implement a zero carbon Wales than now; it will always be more expensive. If we make the investment now, and the generation kit is put in place over the next five or 10 years, we will have made the investment while energy is cheaper and we will reap the sales benefit when energy is more expensive. However, I cannot give you an exact price for what it would cost.

[96] **Leanne Wood:** Can you give me a rough idea? How many millions of pounds are we talking about?

[97] **Mr Allen:** Looking at the Stern review, it would be a few percentage points of gross

domestic product.

[98] **Mr Harper:** I do not think that that is quite right, Paul. It is 1 or 2 per cent of GDP using the targets that were adopted in the Stern review, which was for a 60 per cent reduction by 2050. If we are talking about something that is much more rapid, you can scale that up. So, we are talking about 10 per cent, which is much more. As politicians, that will make your blood run cold. I keep saying this, but we have to face the fact that we might be entering a situation that is rather like a war and just have to say, 'It is a question of national survival, and some really big changes have to take place'. We just have to be honest with everybody and explain to them that this is the situation and that we are going to have to make some big changes. It will not be the end of civilisation; in fact, we think that it could be rather fun and could regenerate lots of things. It could be okay. However, it will be a shock and a surprise and will require lots of adjustments. We cannot say that it will be cheap but it will be better than the alternative, as Stern kept saying.

[99] **Leanne Wood:** Do you think that we can learn from countries like Cuba—well, there is no other country like Cuba in this sense [*Laughter.*]—during the special period in peacetime?

[100] **Mr Allen:** There are enormous amounts to learn, because we have become so used to everything happening as normal. It was very interesting for Wales during the fuel blockades, when we were, I think, 48 hours away from not being able to feed ourselves because of the just-in-time management of the food supply system. We have never had major disruptions here. We have never had a special period in Welsh history, but what Cuba had in its favour was the ability to make rapid decisions, to make universities teach urban agriculture and to be able to rethink about the healthcare system.

[101] **Leanne Wood:** So, you are advocating a dictatorship. [*Laughter.*]

[102] **Mr Allen:** The dictatorship that we need is a robust cross-party consensus. That is the only dictatorship that I think that Wales would want, but I can see a big advantage of there being issues of national unity.

[103] **Darren Millar:** Peter referred to the need for a wartime mentality, which you advocate in Zero Carbon Britain, and the need for strong consensus in order to take the project forward. Of course, when you are in a war situation, and the nation's population knows that you are in a war, they will pull together and want to do something. Unfortunately, a significant proportion of the population in Britain, at least, is still sceptical about climate change and the need to take radical action. How do we, as politicians, bridge that gap and ensure that our policies are acceptable to the public so that we can do the job that we, around this table, know that we need to do in reducing our carbon emissions and improving our energy security in order to make us a viable nation for the future?

[104] **Mr Allen:** We have to accept that elected representatives have to work within the bounds of what civil society expects, but, in my mind, the robust nature of the evidence about serious climate change is irrefutable. However, the way in which that has been communicated to civil society has been piecemeal. In England, there was a climate change communications fund, which non-governmental organisations embedded in different sectors and communities could apply for, to communicate the issue of climate change, but that was not available in Wales. As elected representatives, if you want to create a safe space in civil society to allow you to make the bold decisions that you know need to be made, putting a small amount of money into education programmes, using the science that we have, and getting that into different social circles—such as the Women's Institute, Merched y Wawr, schools, and so on—and empowering NGOs that are already embedded in the community to do the educating on your behalf, is a relatively small investment.



[105] **Darren Millar:** You mentioned that in England there has been a communications fund, but, clearly, if you look at public opinion over the border, it has not been that successful. It may have been successful in persuading some people, and it may have added a few percentage points in favour of certain radical solutions, but it does not appear to have been successful on the whole. The British people are sceptical about many things, such as Europe—a fortune has been pumped in by successive Governments to try to persuade people that it is good to be part of Europe, and so on, yet people are still sceptical. We do not want that to be the situation with climate change and we need to take radical action to solve that. You mentioned getting party-political consensus but you are probably aware that that is quite difficult in the adversarial politics that we have in Wales and the wider United Kingdom. How do we solve that? Is there a magic wand, or is it a holy grail—a quest that we will never achieve?

[106] **Mr Harper:** There is no magic wand; there is no way to make people change their minds overnight. It is something that we discuss a lot, because we are also in the persuasion business and we know that it has limited success. I feel that, in a sense, we have to develop the alternative decarbonisation narrative as a parallel story. I would like it to be discussed everywhere by everyone, like a kind of soap opera, where people would say, ‘It is not going to happen, but what would it be like if it did?’. We always tell ourselves stories and I think that it would be helpful if we were able to rehearse the arguments in a safe space, in case it proved necessary—if there was world agreement, a huge disaster or if oil suddenly peaked with a vengeance to \$300 per barrel, putting the cat among the pigeons.

3.30 p.m.

[107] The same thing happened at the beginning of the war, in 1939, I think, when the Nazis invaded Poland. Everyone said, ‘Okay, that is it’ and then everyone was prepared to go on. That is the magic bullet, as it were. There seems to be a need for a crystallising event, which we cannot predict. We need the narrative.

[108] **Mr Allen:** Doing the scenario, the visioning, and the planning work gives us a plan in case we need it, but it also allows us to envision the positives that society might want. If we had a mass programme of retrofitting insulation into all homes in Wales and we were training lots of young people, there would be no unemployment because, if you did not have a job, you would be brought into the home insulation scheme. People would find a sense of social purpose and would have a collective mission, which perhaps society lacks at the moment. I would also say that the climate change communication fund in England had nowhere near enough money to do the job. We really need to think big about this, because the potential consequences are enormous, but so are the potential benefits to society of having this vision that we are working on together. Even if we did not have this challenge, we need to start doing more things together and have a collective purpose to keep society intact. The individual, self-gratifying consumer economy does quite well on the up, but, once that plateaus and goes into decline, it is very hard to maintain social cohesion.

[109] **Leanne Wood:** I want to go back to the price of carbon. Could you tell us what the price of carbon would need to be for the costs to outweigh the benefits?

[110] **Mr Harper:** A British economist—and he may be Scottish, but I am not sure—has looked at the implications if the price were £10 per tonne, £100 per tonne, and £1,000 per tonne. That is quite a big range. The £10 per tonne is the Mickey Mouse level that you get if you fly to New York and then just buy a tree. The £100 level is about twice the going rate now, so that is getting to a more serious level, but would probably not trigger serious changes. The £1,000 level would definitely make a lot of changes, and you can do the sums and find that it does not cripple the economy, but it rapidly turns it over, and would drive the race out

of carbon. However, we do not have the power—and perhaps even the British Government does not—to impose a shadow price or a tax suddenly. For one country to do it unilaterally would be difficult. Wales certainly could not do it. However, we could probably have shadow prices, which is sometimes used in planning. If you are trying to choose between several different options, you can include a shadow price, which is an imaginary price of carbon, for a particular option at a level of, say, £100 per tonne. You could then see which option would comply more with the policy direction in which you wished to go, and you could choose the correct one accordingly. It is sometimes worth doing it as an exercise.

[111] **Leanne Wood:** Thank you for that. I have one final question. Rather than going for a zero carbon Wales, do you think that a 20 per cent carbon Wales would be more realistic and more achievable in cost terms?

[112] **Mr Harper:** Of course it is more achievable, and of course it is easier; it is just physically not realistic. However, we have to acknowledge that there is a huge gap between what the physics, or the natural scientific evidence, is telling us and what is politically and economically imaginable right at this moment. There is a big gap there. You are on one side of it and we are on the other. *[Laughter.]* It is difficult, but let us go for 20 per cent. Let us see how far we get.

[113] **Michael German:** Thank you. I will conclude this session by asking you the question that you were trying to pose to us earlier: if there were one achievable policy initiative that would make a difference that you would like to see the Welsh Assembly Government take up, and so you would like to see in our report as a recommendation to the Government, what would you put forward? David gave us his view earlier, but whether he will stick to it is another matter.

[114] **Mr Allen:** If it was just one, it would probably be a zero carbon Wales strategy, but it is probably cheating to say that. *[Laughter.]*

[115] I think that it would have to be one that enabled the massive renewable resources of Wales to become an economic benefit for Wales. It could be through a feed-in tariff or a Wales renewables programme on the scale of Apollo. There are many different ways of responding to that. The energy is out there, energy use is going up all the time, and we have the potential to cash it in for Wales.

[116] **Michael German:** I am sorry to push you here, but you said earlier—and I think that you were being very polite about what you thought of the Government's current policies—that there was good vision, good strategy, but no action.

[117] **Mr Allen:** I did not say that there was no action, but—

[118] **Michael German:** Was it 'lack of action'?

[119] **Mr Allen:** Some of the existing targets set by Government are not being met by its own indicators, which reveals the need to accelerate action.

[120] **Michael German:** It is that area that I am asking about. What practical steps would you like to see taken? Your answer is very clear. Would you want to opt for a different one, Peter?

[121] **Mr Harper:** I do not know which the best one is. From my research point of view, I would love to see the Welsh research community get more stuck in. Paul made a remark that it is not just a question of finding extra resources for research. Under the circumstances in which we find ourselves, a lot of the research that we are doing is not what we ought to be

doing at this point in time. I would like some sort of research initiative in Wales that would ask, 'Who would be prepared to drop what they were doing and get stuck in to this great problem that we are looking at now?'. I would really like to see some kind of undercurrent of movement within the research community in universities, including all the students.

[122] **Michael German:** Thank you very much indeed. Do you want to reflect on yours, David, or are you going to stick with the same one?

[123] **Mr Hood:** I will stick with the same one.

[124] **Michael German:** Well done.

[125] **Mr Allen:** Could I add one more?

[126] **Michael German:** Oh, we are going to get two, are we? [*Laughter.*]

[127] **Mr Allen:** It is in relation to the means of how we might get it. I would really welcome a continuing professional development programme for all public servants, be they a school headmaster, someone procuring school dinners, or someone doing structure plans. Just as a scaffolder needs an up-to-date ticket to work on a building site, for those public servants to do their jobs, we need a continuing professional development programme that brings all of this education about the benefits and challenges of climate change and energy security to decision-makers throughout Wales. That way, everybody who has to make a decision is fully aware of sustainability, the challenges and the choices. I think that there is probably already a CPD budget embedded in the Assembly and throughout the public sector, and so we just need to bring in these issues so that everybody feels empowered to make the brave decisions that need to be made.

[128] **Michael German:** Thank you, Paul, for that very positive conclusion to this section, which I will now draw to a close. I understand that there may be some reshuffling of chairs while people are added to the table. Is that the case?

[129] **Dr Hawkins:** It is.

[130] **Michael German:** Right. I do not know how we will do this.

3.39 p.m.

### **Yr Wybodaeth Ddiweddaraf ynghylch Strategaeth Zero Carbon Britain Update on the Zero Carbon Britain Strategy**

[131] **Michael German:** We will now move on to the second section of today's meeting. If Paul is doing the presentation and would like to take the podium, that would leave one seat free. We have about 25 minutes for this item, but I would rather like to take some questions from Members as well. Could you split that up into time for the presentation and then for questions? I think that I would prefer to do it that way, so take five minutes, or 10 at most, for the presentation.

[132] **Mr Allen:** I would find the questions much more valuable than just going through the document. We have a printed copy, which we can give you to take away.

[133] **Michael German:** Okay. If you outline your report and strategy, we could then ask questions.

[134] I welcome to the table Tim Helweg-Larsen, the director of the public interest research

centre here at the Centre for Alternative Technology. He will also take questions from Members when we get to the end of the presentation.

3.40 p.m.

[135] **Mr Allen:** In 1975, the Centre for Alternative Technology opened its doors to the public and began a process of evaluating the emerging alternatives to fossil fuels to see which ones worked and which did not. We also evaluated the challenges facing society. In 1977, we produced a document called 'An Alternative Energy Strategy for the UK'. That was the first time the UK Government had had a vision presented to it in which economic growth was decoupled from energy consumption, and we began to introduce some radical energy efficiency measures and to promote what were called at the time 'ambient energy devices', as no large wind turbine devices were available in the 1970s. Given what we have learned in the previous 30 years, we have recognised that the challenges have become much more severe and so we felt the need to revisit the original document, re-read the science and reproduce it. So, we explored the latest understanding of what we call the 'global context'. That is linking the current understanding of climate and energy security and international security and incorporating it in one document. When we read the climate science, we realised, as many people now understand, that what we are doing is only the trigger for a much larger climate problem, which is the feedbacks in the natural systems.

[136] When we looked at energy security, we found that we were in a similar situation to what happened in the North sea. We have now passed the mid point of the North sea reserves. We have had the easy light, sweet oil from the North sea and we are now into the second half of north sea reserves, which is more difficult to extract as it is heavier and gloopier and is in smaller, bittier, more remote fields. So, production from the North sea is going into decline now at a rate of some 4 or 7 per cent per annum.

[137] All of the oil reserves in the world, if integrated, have a similar bell-shaped curve and, at some point, we will cross the mid point of all of the liquid and gas fossil fuels available, and we will then go into global decline as a producer. It does not mean that we are running out of oil; there is still a huge amount of oil left, but the shape of the curve is a bell, which is very common in nature. On the upside, energy demand has been growing and energy supply has been able to keep up with it. However, we will reach a point at which there will be a plateau and a slow decline, and, if energy growth in India, Asia and China continues, the price will go through the roof and some people will not get all the energy that they want.

[138] We felt that it was essential first to link climate security and energy security in the same strategy. However, if we look at having to go down some form of carbon descent curve, we have to recognise that countries around the world, particularly in the majority world, are starting from different positions. The amount of energy used per head in Afghanistan or in many Asian countries is radically different from that used in the USA, Canada and the middle east. If we are to get everyone in the world to sign up to a system where we all work together to decarbonise, which is what we have to do, building some sort of equity component into that will be essential.

[139] We also came at this from the point of view of not using new nuclear power. If we want consensus from countries around the world on this and if we use new nuclear power to solve climate change while forbidding other countries to use it or while restricting their access to it, international diplomacy will be difficult.

[140] The document was originally about redefining energy. We thought of the provisional title, but when we looked at the science, we realised that it was so urgent that we had to stop using fossil fuels as quickly as possible, and doing so within 20 years seemed to be the most realistic timescale.

[141] From that reading of the science, we then evaluated all of the national and international policy measures that we could find and that people had thought of. We did extensive research to see which policies were fit for purpose. On the international level, by far and away the most believable and feasible is called, *Contraction & Convergence*, developed by Aubrey Meyer of the Global Commons Institute. Essentially, we have to work towards converging on a global fair share, that is, to have international equity of access to the ability to release carbon, and then to go down the carbon descent curve together. That is the only way in which we will get India, China and the majority world to buy into any sort of international framework. That gives us a residual carbon endowment that we can burn in the UK but will not trigger the runaway climate change effects, and we then have to look at a way of distributing that equitably between households and industry. The most acceptable and exciting framework that we found was called tradable energy quotas, which is outlined fully in the report.

[142] When we had selected the policy frameworks and looked at how they related to each other, we then tested them out and ran a technology roll-out scenario, and we tried to pick the worst-case example, which was an isolated, self-reliant UK scenario or Ireland/Britain scenario. We then looked at how those policies might play out in practice.

[143] The first part of those was a power-down scenario, essentially recognising that how we use energy now is rooted in the 1930s when oil was abundant—in Texas, virtually as cheap as water—and climate change was not even on the radar. We have a bad attitude to using energy that is rooted in our past, and we need to rethink that. Part of that is recognising that the market that delivers the goods and services that we enjoy is carbon blind and it gravitates to the lowest cost option and not to the lowest carbon option. Consequently, we estimate that we use around twice as much energy as we need to deliver the wellbeing that we enjoy, in relation to personal mobility, keeping the lights on, keeping the children fed and so on. So, through a power-down approach, we think that we could lose around 50 per cent of the dead energy from the system that is not productively delivering our wellbeing.

[144] At the same time, we looked at the UK's strategic renewable reserve and at how quickly we could build technologies that could harvest that. We looked simply at where we could get the two lines to cross the quickest. We think that, in a 20-year period, we can switch over to a renewable Britain and a very much more energy-efficient Britain.

[145] We did it primarily to work outside the blinkers of having to work within direct economic or direct political frameworks. We just looked at what needed to be done and explored how it could be done, to raise the matter for debate and also to recognise the fact that, as the serious nature of energy security, international security and climate security permeates into the mainstream, we can identify the areas of most urgent research where we find that we need to know more. It raises questions that we did not know before we started this process, to inform Government and civil society, hopefully, of what research needs to be done. So, as we approach 2012 and beyond—and we need to make some radical decisions—we will have done the right research beforehand. I think that I am happy to stop there and take questions.

[146] **Michael German:** Thank you, Paul. Could you expand on your notion of tradable energy quotas and tell me whether you think that there is any connection between that thinking and how Governments around the world seem to think about trading carbon, which is a similar means of trying to alter the economic framework in which all of this sits? Does that mean that the poorer countries could continue to do what they do without being overly fearful of not being able to meet worldwide obligations? Is that what is behind all of this?

[147] **Mr Allen:** I will hand over to Tim to answer that question.

[148] **Mr Helweg-Larsen:** First, tradable energy quotas are, essentially, a national as opposed to an international scheme. There are strong parallels between it and similar approaches internationally, such as *Contraction & Convergence*. I will expand in a little more detail on what tradable energy quotas are and how they work.

[149] Essentially, we would be looking at a national carbon budget, so we can see how that would work on a UK basis. It is tricky to see how it would work on a Wales level, but, in essence, you take a national carbon budget and say that you are going to burn only X tonnes of carbon over the next 20 years. We can then plot what the budget will be annually. So, it will start large and will shrink. Each year's annual budget would then be distributed to people and businesses in the country according to the split in how people and business burn carbon today, so it is roughly a 40:60 split. Forty per cent would be received by individuals as a matter of right into their tradable energy quotas account, and the remaining 60 per cent would be auctioned to business and industry.

3.50 p.m.

[150] That is how you get the quotas into the system. I will explain how they are used. If you or I go to a petrol station and engage in a direct fossil fuel purchase—you are going to buy some oil or a bag of coal, or pay a gas bill, so you are purchasing fossil fuel directly—then, as normal, you hand over your cash to make that purchase. However, you also have to relinquish some of the carbon permits that have been given to you that week. If it is getting towards the end of the week, and you are running low on carbon permits—you may have been doing a lot of driving—then you might be able to turn to your neighbour, who has been cycling everywhere, and you can buy permits off her. Alternatively, if you are at the petrol station, you could just pay extra cash—you would effectively be paying the spot price for carbon on top of your petrol cost.

[151] Therefore, wherever you go to purchase fossil fuel, you will be paying an extra cost. If you are not purchasing fossil fuel—or you are doing things through other routes—then that cost is avoided. Did you have a question, Leanne?

[152] **Leanne Wood:** Is that not a way of ensuring that the people who have to cut down on their carbon are the people who do not have much money? Some people do not have to worry about it, so they will just pay extra all the time. If you are a millionaire, why should you be concerned about cutting your carbon?

[153] **Mr Helweg-Larsen:** That is a good question. If you were to imagine a David Beckham, for example, what will stop him from carrying on flying everywhere? Let us make it political—what will stop Lembit Öpik from flying back and forth to London? The answer is that, if he has the cash to pay for permits, he can keep buying permits, but there is a limited number of them—you cannot keep doing that forever, and who does the money go to? It goes to the people who are prepared to sell them, and that would be—

[154] **Leanne Wood:** Redistribution.

[155] **Mr Helweg-Larsen:** Yes, it is, effectively, a redistribution of wealth. It does not solve all the problems; there will be people who are disadvantaged, but it will be a minority. What this provides us with is an overall framework that means that decisions—everything from how you are going to fill up your car, to how you are going to get the kids to school, to what energy system you are going to put in for a new hospital—start being done in the context of carbon, because you will always have to pay this extra cost if you use carbon.

[156] **Leanne Wood:** When you say that some people would be disadvantaged but that they

are a minority, who would they be? Would they be the poorest people in our society at the moment?

[157] **Mr Helweg-Larsen:** Yes, they would be the poorest people, and we would need to have secondary legislation to support them. To give you an example, if you are receiving your carbon quota, week on week, year on year, and it starts off being a surplus, as the years go by, it will shrink to match your actual energy requirements. Therefore, in the early years, you might be selling a bit of surplus, but then you get down to the fact that it is just covering your oil bill. However, if you are a low-income household, and you do not have the disposable income to insulate your house and prepare for even less carbon use in the future, then you are going to be disadvantaged, and there needs to be support in place to do that.

[158] However, that should not put a dampener on the fact that this provides us with a way of guiding many transactions and choices in society. Therefore, if you imagine, for instance, that you are not buying fossil fuel directly—let us say that you have gone from the petrol forecourt at Tesco into the supermarket itself, and you are deciding which loaf of bread to buy or you want to buy a new frying pan. There might be two identical frying pans, as durable and well-made as each other, but the key difference is that one is cheaper. The cheaper one could be cheaper because it was made using renewable energy, for example, it was from a wind-powered factory as opposed to the other frying pan, which came from a coal-powered factory. The coal-powered factory would have an extra cost, because the manufacturers would have to buy carbon permits, and they would pass those costs on. So, consumers, just by paying cash, would inherently start to make green or low-carbon decisions.

[159] To finish off, and answer the beginning of your question, that is an expansion of the tradable energy quotas. How it sits in the global context is that multiple countries could trade national carbon permits with each other, but we really need a global budget to put a cap on carbon internationally.

[160] **Michael German:** I have asked my questions; do Members want to ask any other questions about the report that was presented to us?

[161] **Lorraine Barrett:** Paul, I was interested in the paragraph on powering down. That is a great term, which a lot of people can understand quite easily, as is 'energy obese'. They are descriptions that most people can grasp. They make me think of our houses and everything that we have in them. As you said, powering down does not mean that you must deprive yourself of anything. I am aware of a product that would control all the switches in the house or office—with one switch you could turn everything off. Can you tell us a little about that, because I not seen it on the market, and I wondered if you knew about it?

[162] **Mr Allen:** The market is carbon blind, so it has devised all sorts of appliances that have standby electricity consumption, and so you are using energy that delivers no service whatsoever. We need to get rid of this dead energy in the system. It becomes a chore to go around and turn every switch off, and then you forget and think, 'Oh, I've left everything on standby'. The device is simply something whereby you can put one button on the wall by the door that, when you go out, sends an infrared or radio signal to all of your power sockets, and everything goes off. There is just one switch, which makes it easy for people. It also recognises that all this dead energy has an economic and an environmental cost, but does not deliver anything to us.

[163] Another example is that people, particularly in a rural area, value personal mobility. It is important to us. However, if we are to maintain personal mobility in the twenty-first century, we cannot do it by moving a tonne of steel around with us every time we want to go somewhere. We need to think again about personal mobility. For a lot of journeys, light electric vehicles hold enormous potential, but we need incentives to get the market to want to

drive the development of the technology. Think of the incredible developments that the market has driven: compared with the brick that we had a year ago, we now have a tiny little mobile phone on which you can have your life's vinyl collection and with which you can book a theatre ticket in New York. We can do extraordinary things, but we need to ensure that the market is working for us. This is why we value tradable energy quotas, or some form of scheme that makes the market see the carbon, so that the market drives the technology in a way that is good for us.

[164] **Michael German:** Please answer this briefly, Tim, because there is a final question before we finish.

[165] **Mr Helweg-Larsen:** I wanted to add that there are many technological options waiting to jump up, if we can see energy as a more valuable commodity than we do today. The switches that will turn off all your appliances are one step in that direction, and we can already start to see that there are more sophisticated options around the corner. In Germany, information signals are being sent down electricity wires informing large appliances of the price of energy. If you imagine this on a domestic scale, your freezer, your immersion heater and your washing machine would all know the price of energy, and your washing machine could do its cycle in the middle of the night, when it is cheapest, which is when there is least demand for the renewable energy supply that we would be giving. Likewise, it does not matter when your immersion heater provides energy to your hot-water tank, as long as it does it at some point in a 24-hour period. All sorts of such things will come to the surface, as soon as we start seeing energy and carbon as valuable.

[166] **Michael German:** One short further question and, hopefully, a short answer.

[167] **Darren Millar:** Going back to tradable energy quotas, which you describe as a 'vote winner' in your report, which I find interesting, one of the things that the UK Climate Change Bill will allow for is the creation of an energy trading scheme in Wales, if the Welsh Assembly Government is to introduce one. How realistic is that sort of proposition—to have one within a single part of the United Kingdom?

4.00 p.m.

[168] **Mr Allen:** Once we start looking at a zero carbon Europe scenario, we must consider that there are many countries that border each other—the Czech Republic, Slovakia, Poland and so on. We will need to develop carbon-visioning and carbon-measurement technologies between countries that have a lot of interchange of personnel and energy across the borders. It is an interesting challenge, and the first step towards it would be for the Assembly to fund the creation of a zero carbon Wales strategy, just to see what it looks like. It would be useful information for all sorts of future-focused Assembly decision-making.

[169] **Michael German:** At that point, I thank you for your conclusion. We are dead on time. I thank the Centre for Alternative Technology for its hospitality today, and I thank you for presenting to us and taking our questions. We are grateful; this has been a splendid first outing for the committee away from Cardiff bay. I hope that there will be many more like it. I declare the meeting closed.

*Daeth y cyfarfod i ben am 4.02 p.m.  
The meeting ended at 4.02 p.m.*