

“The Mid- to Long-Term Global Vision for Challenges against Global Warming”

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<Keynote Speech>

“UKCCC Role for Emission Scenarios and Reduction Policy in UK”

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Thank you very much. It's a great pleasure and honor to be here this afternoon and I would like to talk to you about the UK Committee on Climate Change and some of the work we have been doing there which I hope will be of interest to you.

(Slide2)So, this is a law that went through Parliament in the UK, about a year ago, and this was certainly a new venture for the UK. And I think actually, probably the first in the world to actually set in the laws of the country a carbon dioxide reduction target. And this is what this bill that went through Parliament last year did then, the first thing, a commitment to reduce by 2050 at least 60%, was the bill, and then established a system of legally binding carbon budgets, so those will be three 5-year targets from at least three of them available at any time and then establish the Climate Change Committee as an independent body to advise on the budget levels and also the policies to reach them.

(Slide3)So the committee was formed formally at 7 o'clock in the morning on the 1st of December, last year; 2 hours later, we produced our first report! So, we had actually existed in a shadow form for 6 months before that and which enabled us to do our work, but the Queen did not sign the bill until the last minute before our report was produced. And our first report then last December was on various issues, and I won't go through all of them. There are items to do with various things that governments have to think about. But the main thing that our Committee then is doing is actually specifying this target, specifying the 3-year budgets, including the present period and best items to do with how much we should do ourselves and International Aviation and Shipping and other greenhouse gases.

(Slide4)So that was the setting up and then last year we produced our first report, which dealt with those wider issues. But in particular, the part I will be talking about today, most of the time, is the first part what we thought the global emissions of carbon dioxide should be through till 2050 and then we decided what the UK contribution should be and then the rest of the report was saying how that might be done.

(Slide 5) So, as background to the setting of the global target, I am only going to show really one picture here which is from the IPCC work and this is showing for the December to February period in the top line and June to August in the bottom line, the temperature and precipitation for a scenario which is the sort of scenario we are following at the moment, if you like business as usual, but I don't believe business as usual would be possible by this stage.

This is later in the century, the 2090s, and it shows the projected temperature differences over the century. In the global average, it is somewhere 3 to 4 degrees, but if one looks locally one is seeing maybe three times that in the northern continent, and almost everywhere over the continents, the value is greater than that global number of 3 to 4 degrees. And the precipitation changes very significantly, in particular dry areas tend to become drier. The Mediterranean, Southwest USA, Australia, become much drier and then the northern regions become wetter.

(Slide 6) Now, we are not confident in the details of these pictures, but I think the general notion that the world will have very different temperatures regionally and precipitation changes that make life very difficult. I believe that this is a world where business as usual would not be possible, in fact our activities would be extremely difficult. And that then is the background to the criteria we set ourselves.

We were using a probability description and in that probability description, we said for the maximum temperature in the 21st century that the 50:50 level should be close to 2 degrees. We did not say it has to be below 2 degrees. We are not aware of any thresholds in the climate system at exactly 2 degrees, but it is very clear that the impacts increased quite rapidly as one goes beyond 2 degrees. So we made the one criterion, the 50:50 level should be close to the 2 degrees, but the second one is that the probability of entering the world that I showed you in the previous slide, should be very, very small, because we believe that that is a world where human activity would be very difficult.

So the modeling that we used for this was linking with the Jason Lowe at the UK Met Office Hadley Centre, and we used an idealized model which has been tuned on the full climate models. And we did not use that model with one set of parameters, we used it for a range of values of three crucial parameters which gives us then this probability range because at the moment we are not confident on those values to be deterministic but we think we know the range for those parameters. So, that is what gives us the probabilities.

(Slide7)And we then considered we only had a few months to do this, so we could not consider a vast range of scenarios but we considered some with the global emissions peaking at 2028; this picture here, or at 2016. The other curve here is actually the 'business as usual' curve that we were on, according to the previous scenario I showed you.

So these are the peaking years we looked at, 2016 or 2028. And then after that peaking year, we looked at various reduction rates from 1.5% through to 4% as the highest value.

And the third thing for this scenario was the floor level that it goes to after this decrease. And we had a high level here or a lower level here. And the lower level is assuming there is only emission from non-CO2 greenhouse gases. So there are zero carbon dioxide emissions, but we thought it was going to be very difficult to get rid of some other emissions, particularly from agriculture in methane and nitrous oxide. So, that is the level we went down to there or there is an alternative higher level which includes some carbon dioxide emissions continuing at a rate.

I should say all our pictures are for carbon dioxide equivalent. And so this is putting the non-greenhouse gases, non-carbon dioxide greenhouse gases in terms of carbon dioxide. And it is gigatons of carbon dioxide rather than gigatons of carbon. There is a factor of 3.7 roughly between the two. So, those are the scenarios we looked at and a few others that I will not show you. So to give you an idea of the sort of information we had then available from the model, these are the atmospheric carbon dioxide equivalent concentrations as given by a number of scenarios here.

(Slide8)Let me take this one here (top right) which is for a 2016 peak, 3% decrease from that peak and to that higher floor level. And this is the 50:50 line here and this is from 2000 through to 2200, and the 50:50 line rises from the present value up through to just over 500 and then is reasonably stable at that level. However, we paid a lot of attention also to the extremes, and this is the 10% level and this is the 90% level. So, 10% of the runs of the model achieved levels above this. So even though the 50:50 level is stable somewhere near 500; there is a 10% chance still of going nearly up to 700 parts per million by the end of the century.

Now we can compare is a 2028 peak (top left) with the same parameters apart from that, and you can see with the later peak the level of the 50:50 is over 550ppm rather than 500. And importantly to us, the 10% level is very, very high and going towards 900ppm or so by 2200. So there is a significant chance of going to extremely high levels with that later peak. Comparing now these two here, they are both for 2016 but this (bottom left) has the lower floor

level that is achieved by soon into the 2200s and so there is zero carbon dioxide emissions here which will link with Professor Matsuno's talk next. This one goes towards zero carbon dioxide emissions, and here the 50:50 level goes just above 500 but then decreases afterwards as opposed to that stable level there and importantly to us too the 10% level is near a 650ppm rather than near a 700.

And finally then, if you compare the two lower panels, this (bottom right) is with a greater decrease rate from 2016 and the maximum achieved is slightly less and the decrease is greater after that time. The upper 10% level is significantly lower than with the 3%.

(Slide9)Choosing a couple of pictures of the global mean temperatures again, this is the 50:50 level and the 10% and the 90% levels and these are both pictures for 2016 peaking, but this (left) is with a 1.5% decrease and a high floor and this is a 4% decrease and the low floor. One can see that the former does not satisfy our criterion. It goes well beyond 2 degrees and there is a significant chance of going into this 3 to 4 degree world.

So we decided that the right panel case is the sort of scenario we wanted to go for because this goes slightly above 2 degrees in terms of the 50:50 level but then starts to decrease and there is a 10% chance of reaching this 3 to 4 degree world but not greater than that.

(Slide10)Another way of putting these results is to look at the cumulative distributions. So if we look at this curve here (left), this is for the peaking at 2028 and this is the 3% reduction and it says there is a 80% chance of getting above 2 degrees on this and indeed a greater than 20% chance of getting above 3 degrees in that scenario. For these reasons we thought that the 2028 peak was definitely too late and we went for this earlier peak of 2016 and these 3% or 4% reductions which leads to the 50:50 level being just over 2 degrees and only about a 10% chance of reaching 3 degrees and very low chance of reaching 4 degrees (right). So those are the scenarios that we thought were acceptable.

(Slide11)And in terms of gigatons of carbon dioxide equivalent these are the two scenarios, both with the low floor and essentially zero carbon dioxide emissions by 2160. This is the 1990 levels of those greenhouse gases in the emissions and this is the 2007 level. There is nothing magical about 2050, it is in the middle of this period on the way down, but if one looks at these levels of 2050 then these two have correspondingly something around 20 gigatons of carbon dioxide equivalent compared with these levels in the earlier years.

So the reductions in 2050 are of the order, 34% from 1990 or 46% from 1990 or correspondingly greater 50% to 60% from the 2007 levels. So this is broadly in line with the G8 commitment, but that was not our starting point. Another perspective that has come to the fore in recent years is to consider the cumulative emissions and in terms of those cumulative emissions for various sets of years in terms of carbon dioxide equivalent, gigatons of carbon dioxide equivalent or in terms of teratons of carbon equivalent. The levels for these years are something in the order of 2500 gigatons of carbon dioxide equivalent or somewhere in the order of 0.7 teratons of carbon.

(Slide12)Just to give a little bit more information than was in our report, this is work again by Jason Lowe at the Met office thinking of various scenarios that would achieve a 50:50 level of 2 degrees. And these are for various peaking years of 2014, 2016, and 2020. Different reduction rates but you find it has to be at least 3% per year. If you go for the later peak then you have to drop at a greater rate and with all these the lower floor in the later years makes it easier to actually achieve the target. So the later the peak, the greater the drop, and the lower the floor rate has to be.

(Slide13)And again, from this cumulative carbon perspective, this shows a range of runs of the model. This is the gigatons of carbon dioxide equivalent 2000 to 2050 and this shows the probability of getting above 2 degrees. So that if you want a 50:50 level of 2 degrees then ones in a range for the period 2000 to 2050 somewhere in this range here, somewhere around 2000 gigatons of carbon dioxide equivalent.

(Slide14)And my final one on the cumulative carbon perspective, this is from Myles Allen putting together a lot of papers that have given some perspective on this. So here we have cumulative emissions since the pre-industrial period and up to 2500 and these change the maximum temperature, the peak warming achieved or this is the peak warming if only the CO₂ is taken account of. This includes all greenhouse gases and there are number of studies. This is our latest climate change committee study here. All of them suggest that it is somewhere if one is going to achieve or not exceed 2 degrees by much, the total emissions of carbon dioxide and other greenhouse gases must be the order of 1 teraton in the whole period, but the non-CO₂ greenhouse gases, methane, nitrous oxide are not very well captured by this perspective and they really have to be dealt with separately.

(Slide15)Now to return to the climate change committee work, then this is what I have shown you already as our target. If one thinks of this 2050 target, then these ranges here, this 2050

figure here if one divides that by world population of 9 billion that works out as 2.1 to 2.6 tons of CO2 equivalent per person in 2050.

(Slide16)Now this is the final point we have reached for the global study. We then said what are the UK targets we should take from this. We considered that by 2050 there could be no possible agreement other than every citizen of the world being entitled to the same emission. So we said this is what the UK target should be for 2050 a 2.1 to 2.6 tons CO2 equivalent per person in 2050. For the UK, that means a reduction from 1990 of some 80%. So that's where we have been in this last period. We have had some reductions but this is the 2050 target down here and this is a target that now is enshrined in law in the UK. Our government has by law to be going towards this target. We include international aviation and shipping in that target although we have not yet said how that will be done.

The other levels here then are these targets in between because we believe it is no use just having this target out here. The climate change bill said we had to have 5-year targets for the next 3 periods and soon we will have the next target here. We set two levels for these following what has been agreed in the European Union, we set an interim level which we wish to go towards anyway and which should be achieved internally by our action in the UK. We had an intended level also if Copenhagen is successful and those levels correspond by 2020 to a 42% reduction below 1990, or 34% as the interim even if there is no agreement.

The interim budgets have been accepted and are in law in the UK, the intended will be revisited after Copenhagen. So that is what the UK has agreed to and is duty-bound by law to go towards these targets.

(Slide17)So we also then said how did we expect that those targets could be achieved. Being an independent advisory committee we are not allowed to prescribe to government what they do, but we can tell them the sort of thing they can do and we also have to show that the targets are possible to achieve. We indicated reductions in all sectors; the power sector putting a profile for renewables, for the UK of 23 gigawatts of wind by 2020, nuclear of the order maybe of three nuclear power stations by 2020 new ones, carbon capture sequestration of the order of 4 for developments of CCS at large scale. Once those have been developed and the electricity supply has been de-carbonized then that electricity can be used for transport and also for heat. In transport, we have gone for the move towards electric cars with fuel efficiency in the shorter term and perhaps some bio-fuels. Again, a lot of efficiency in buildings and industry.

(Slide18)So this is one scenario for the UK of how that 80% reduction could be achieved where we look at the different sectors from agriculture. This is industry, this one here is electricity and this shows the importance to us of de-carbonizing the electricity supply which starts to become very powerful in the 2020s and by the end of the 2020s has just about been achieved. And then this helps the reduction of the transport emissions as that electricity can be used in transport and also in the residential sector as well.

(Slide19)Just concentrating on the power sector, this shows the carbon intensity that we propose for the UK electricity generation. That shows this reduction in the 2020s and the use of electricity goes down slightly until this de-carbonization and then increases after that.

(Slide 20)So earlier this month, we produced our first annual report on the progress towards the targets. And of course, there has not been long to actually get anywhere during this year however, we used this opportunity to make some statements about the sort of progress that has to be achieved. This is the website of the Climate Change Committee if you wish to see more about our activities.

(Slide21)So in this latest report, we set up the framework in which we are going to monitor the UK's progress. So it is not just achieving the latest budget, it is also setting in place the activities which will enable future targets, e.g. developing carbon capture sequestration. We also look to the impact of the recession and some fine tuning of our estimates and trends in the recent period.

(Slide22)So one of our statements, is that carbon dioxide emissions have been falling at half a percent per annum recently. If that continues, we would see the gray curve. The blue curve is what we need with cuts of the order 2% to 3% per annum through this first period. This is the case in all sectors and it led us to make the statement that there is a need for a step change in the rate of emission reduction. So that was our very strong statement to the UK government and our parliament that we need a step change in our activities.

(Slide23)We also looked at the impact of the recession which first is giving a misleading view of how well we are doing because our emissions have gone down but not for the right reasons. Secondly, it has also perhaps undermined long-term progress through the low carbon price. The second here is again the need for a step change.

(Slide24)So my final slide then is just listing some of our future activities. In December of this year, we will be reporting to the UK Parliament on aviation. The government has asked us to tell them how the emissions can be scaled back to 2005 levels by 2050. We will also reconsider the old targets and set a new target for the next 5-year period. We will be looking at the inclusion of the non-CO2 greenhouse gases and the inclusion of international aviation and shipping, and will produce our second annual progress report.

But my important message I think for you in this session is the earlier part where we set the global targets, I gave you the criteria that we used and the modeling we used to understand what that meant. Then we came to the conclusion that a peak by 2020 and a 3% or 4% reduction after that to a low level which is equivalent to almost zero carbon dioxide emissions earlier the next century. Thank you.

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