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THE NEW RENEWABLES:
saving and substituting to fill the energy gap

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Moderator: Mr John Llewellyn

MR LLEWELLYN: I am John Llewellyn from Lehman Brothers and I am moderating this session.

First let me tell you that unfortunately Commissioner Almunia is not able to be with us today but fortunately we have with us instead Klaus Regling. I have known Klaus for very many years. Klaus is Director General for Economic and Financial Affairs at the European Commission. He is a marvellous speaker and, even more importantly, he really knows his stuff. We are very fortunate to have you, Klaus, today. Thank you and welcome.

I would like the other two panellists to introduce themselves so that you become used to hearing some other voices.

MR WALSH: My name is Steve Walsh. I am the General Director of AES here in Ukraine. I am also a Vice President with AES Corporation.

MR CARRARETTO: My name is Cristian Carraretto. I am Senior Energy Consultant at MWH Italy and I work on energy efficiency programmes in the steel sector and in the power and innovation sectors.

MR LLEWELLYN: We thought we would start with Klaus speaking to us for about 10 minutes to tell us about the styles of policy, the actions that have been taken by the European Commission, which is of course the world leader and in many ways is setting the stage for energy and climate policy world-wide. That gives us a great framework from which to begin.

MR REGLING: I am very happy to be here and to try to summarise the approach that we are adopting in the European Union. A fundamental shift is underway in the EU in the field of energy and environmental policy.

I will not go into detail to describe the extent and implications of climate change. We can take that as a given. We have to accept that global warming is a reality and one that, if ignored, threatens to have devastating humanitarian implications and a crippling effect on the world economy.

By the year 2030, global carbon dioxide emissions will have risen by nearly 60 per cent and world energy demands will be 50 per cent higher than today. Even today, as you know, soaring oil and gas prices make it clear that competition for energy resources is becoming more intense every year. Thus, increasing our use of renewables and energy in a more efficient way is more than ever a priority. It is clearly the vital means to tackle the environmental challenges and guarantee security of energy supplies in the future, but it can also be a profitable investment and a major opportunity for industry.

This awareness has driven the revolution in the EU's approach in energy and climate change policy. In March 2007 EU leaders agreed on a new vision to cut Europe's greenhouse gas emissions and increase its share of renewable energy. This was followed up in January of this year with a detailed roadmap to translate this political vision into action and steer our transition to a low carbon economy.

Our starting point in the EU is to achieve a 20 per cent cut in our greenhouse gas emissions by the year 2020. We are also prepared to scale up emission reductions to 30 per cent once a global agreement is reached. To do this, we have set ourselves the ambitious target of reaching 20 per cent of energy use through renewables by 2020. We are also working towards a 20 per cent improvement in energy efficiency by 2020.

We are realistic about the scale of the task ahead of us and we are candid about the economic costs of achieving these targets, but we are also clearly aware that the price of inaction would be far greater. Some estimates say 10 times bigger. We should not forget the important long-term savings that are possible if we succeed; for example, a reduction of €50 billion in gas and oil imports by 2020, not to mention the security that will come from being that dependent on carbon-based energy.

In designing our approach and our proposals, careful attention has been paid to ensure that goals can be met in a cost-efficient way using the market to drive change where this is most cost-effective. For example, the EU's pioneering emissions trading system, ETS, puts a price on carbon emissions to make energy use more efficient and

renewable solutions more attractive. We are now proposing to update the ETS to create a truly European market base on common EU-wide rules. The ETS will expand to include more greenhouse gases other than CO_2 and involve all industrial emitters. Under the new system, 40 per cent of total emissions would be covered by the ETS. In sectors not covered by the ETS, such as clothing, transport and agriculture, there will be specific binding national targets for each Member State.

We also propose actively to promote the increase of renewables by allocating binding national targets specific to each Member State to be reached by 2020. Trade between Member States in renewable energy will be made possible by certificates that prove that the energy is produced from renewable sources. This will help Member States to reach their targets in the most cost-effective ways.

Large investments in energy efficiency and renewable energy will be vital to meet our objectives. In particular, considerable investment in new generating and production capacity will be needed to achieve our renewable energy targets. Estimates put the total figure at €600 billion to €700 billion by the year 2020, and this is in a 2005 year credit.

To achieve this private sector initiative, investment must play a major role. At the end of the day, industry must be fully on board if we are successfully to make the transition to low carbon economies. Indeed, business can benefit from embracing the green market. Low carbon technologies are part of a growing industry that now accounts for over €220 billion in annual turnover and there are very real advantages to the first entrants in the market.

Technology has already developed rapidly with renewable energy technologies making wind and solar energy more commercially viable than ever before. Energy efficiency has also been introduced into all kinds of consumer products from light bulbs to cars and sophisticated production machinery. But this process must now be accelerated if we want to overcome the environmental and energy challenges at stake and exploit the commercial potential of these technologies to the full. In this respect, creating the right framework conditions and appropriate incentives is key.

There is already a range of quality instruments available to trigger investment in renewable energy production and improve energy efficiency. In addition to the ETS which I have already mentioned, energy taxes and in some Member States CO_2 taxes provide incentives for technological development in services, transport and household sectors.

In the renewable energy sector additional support is provided with small targeted economic instruments. In order to support renewable electricity, many Member States use feed-in tariffs or premiums to reduce market risks for the investor. These systems have, depending on the level of support, generally been quite successful in generating investment in the supported technologies.

Fiscal incentives are also used by Member States, for example tax exemptions or reductions, to promote biofuels or grants and tax credits to encourage investment. Overall, given the size of the investment needed, our economic support instruments should promote the most cost-efficient solutions. The ultimate aim must be to create competitive technologies which can succeed in the market without support. Therefore, it remains important to foster competition in these sectors and to reduce and remove support once the production costs fall and aid is no longer needed.

In parallel, we must continue to support research and technology developments and to address market failures by facilitating technology development, risk-sharing and access to finance. We also need to ensure that new energy sources are environmentally and socially sustainable. The current global surge in food prices has raised the food versus fuel debate. We are aware that the promotion of biofuel needs must avoid potential adverse impacts on global food markets and land use. To minimise such risks, the Commission encourages, for example, the use of marginal land unsuitable for food production as well as the development of second generation biofuels, which are not in direct competition with food production.

Ultimately, by providing the right framework, the climate change challenge can be transformed into huge economic opportunities. With an innovative and efficient industrial sector, updating our economies to become more sustainable can actually

support growth and jobs. Indeed, the renewable sector alone is predicted to bring one million new jobs by 2020.

Let me conclude by saying that Europe, the European Union, is spearheading a comprehensive approach to building a low carbon economy but the EU alone cannot solve the climate and energy challenges that face the world. A major effort by the entire global community is needed. It must be our overriding priority to reach an international climate agreement in 2009 that will be ambitious enough to prevent climate change from reaching devastating levels over the next decades. That means an agreement that will limit global warming to 2^{o} C.

No-one is suggesting that this will be easy and we will have to step up our efforts just as the economic environment becomes more difficult. Increasing commodity and food prices, turmoil in the financial sector and slowing GDP growth will add to the challenges as overall investment slows. Yet, the longer we wait, the higher the cost of adaptation. Sustaining political determination is vital and in this respect the EU will continue to play its role to forge consensus among international partners and also lead by example.

MR LLEWELLYN: Thank you, Klaus, and clear as always. As you said, this is a very complex issue. It starts with a science, which you took for granted and I think rightly so today, which takes you through to the climate effects and on to the economic costs, which are potentially very considerable, as you said, at the world level if not dealt with. That in turn makes the case for policy to try to avoid the worst of the possible outcomes happening. All of that has to take place before you get to the implications for business.

I myself wrote a report which we published in January 2007. One of the things I said in that, in looking at that chain of events, was that I thought – and it was a guess – that there was a 50 per cent chance that within the next three or five years we would get some sort of global agreement limit to greenhouse gases. The CEOs to whom I talked all said that that seems a bit high. Then we did another report only 10 months later in October of 2007 and I felt that the world landscape had changed. After a lot of discussions with people, including Klaus but people also in America and Asia, I put in

a different guess which was that there was a 75 per cent chance that there would be a global agreement to limit greenhouse gases some time in the next three years.

It was interesting that just in that 10-month interval the attitude of CEOs had been "Well, your 50 per cent figure was pretty sensible but your 75 per cent figure seems a bit high". For me, that is indicative of how fast this whole issue is moving. Certainly the message from our studies was: the world is going to move rather quickly from the policy through to the implications for business. That is where we have to end up because, as Klaus says, this is going to be done in large part by businesses operating in markets. Let us move there.

Steve, could I ask you to take a couple of minutes to set out your stall, if you will. Tell the audience the key points that are on your mind, and then you do the same afterwards, Cristian. We will have a discussion between ourselves to try and bring out the various points that are key, leaving plenty of time for questions from the audience to our panellists, who will do their best to answer your questions.

MR WALSH: First and foremost, I would like to welcome all of the members of the audience. It may be the first time for many of you perhaps to come to Kiev and to Ukraine. For those of you who are not fortunate like myself to live here in Kiev, welcome. You will find it a magical city.

In my opinion the commitment of government is absolutely essential, whether it be a regional government or a state government, to address this issue. Without a strong, firm commitment, basically we will be dead in the water. That commitment needs to be followed by education. What do I mean by education? People need to be educated and to some degree convinced that the issue is real and the issue needs to be addressed. This is not an issue that we want to pass on to our children or their children.

After this education programme, it is important to follow it up with, quite honestly, legislation – legislation from the standpoint that allows both the private sector and public sector to make the changes necessary because without proper legislation in place as what the EU has already put in, and hopefully other countries will do the

same, it will go nowhere. Legislation is part of the key. Last but not least, it needs a workable programme. Without a workable programme, a roadmap, oftentimes people will go down a different direction and not be the most efficient or the most economical. For example, one programme that has worked in the United States is the Energy Star Program. This programme, in combination with the Environmental Protection Agency in the Department of Energy, in 2007 is estimated to make some $18 billion in savings. The way it does that is by promoting economical design in appliances that save energy, energy saving ideas and designs in buildings and houses, and at the same time promote those technologies that save energy. Consumers buy those products, they adapt the building codes and in return you have an end result of savings, as I have said, of some $18 billion in 2007 alone.

This is a programme and just one example – there are others – that does work but without a strong programme and strong support, again like legislation, education and commitment, we will go nowhere.

MR LLEWELLYN: Thank you, Steve. That is very clear. You do not think that the private sector will deliver unless you get a commitment from government which the private sector can recognise. I see your point about education; people have to understand why these policies are going to be in place. Then you have to have the policies, but you have to have a workable programme. Those are the four practical points from a business perspective.

Cristian, is he right or would you want to change or add to that?

MR CARRARETTO: I completely agree with you. When a country scores outstanding economic growth, that is usually associated with increasingly outstanding energy consumption. We need to focus on all possibilities to keep this energy growth as low as possible. There is room for a lot of improvement in energy efficiency programmes in many sectors around our society.

Anyway, once you have to deal with the actual power capacity and the expected demand for energy in the future, there are some reasons for assuming that these countries will also include coal and other fossil fuels to fill the gap.

For instance, the problem in Central Asia and in some parts of Eastern Europe is that we have a lot of exploitable reserves of coal. There are many arguments for assuming that these countries will use coal in the near or mid-term future. The problem is that when you run with coal, your greenhouse gases and other pollutant emissions will dramatically increase as well. This fact is well known. We do not have to stress it any further because we are always debating these issues.

The real challenge is to come up with conditions whereby you have the political will and a real commitment from all stakeholders to become cleaner with the energy, to become cleaner with fossil fuels and in particular coal, which is the most dramatic solution we have at our disposal. At the same time, sometimes it is also the cheapest possibility we have at our disposal to fill the gap between capacity and energy consumption.

MR LLEWELLYN: Let us try to tease out some of those arguments. Klaus, could I come to you first? When you get down to a business decision, the global policy environment in which that is being taken is crucial. I said that I thought there was a 75 per cent chance globally. You are at the heart of negotiations and you are always putting the European position. Do you think that within two or three years we are going to have a reasonable chance of a global agreement, perhaps not involving every country and every fuel? Am I in the right or the wrong ballpark?

MR REGLING: I definitely hope that we reach such an agreement. There was agreement in Bali at the Environmental Conference on Greenhouse Gases in December last year to come to an agreement by 2009. I would agree with you that the probability of that happening has improved since we adopted our package in March last year or since in January last year you placed the probability at 50 per cent. I think it is higher today, partly because the EU has taken action, including follow-up action earlier this year, which was necessary to implement the good targets agreed in March 2007, but I am not sure that I would fully agree with the 50 per cent and 75 per cent. Improvement, yes, but I do not know that it has gone from 40 to 60 or 50 to 75; maybe I would put it a little lower. Certainly the move is in the right direction. The EU has acted.

We know that all the presidential candidates in the United States place much more emphasis on these issues than the current administration. That is encouraging. The US is one of the greatest polluters in the world and energy efficiency in the US is much lower than in Europe. Also, Europe can do better because Japan has a higher energy efficiency than Europe. Europe is not the leader everywhere. We know we have room to improve but in the US there is even more room to improve on energy efficiency. I see progress in several parts of the world. Progress was made at the conference in Bali. I would certainly agree that the chance of coming to an agreement over the next few years has increased.

This will be discussed at the G8 summit in Japan later this year: I also see willingness by the advanced economies and the international financial institutions to help the emerging markets with special facilities to finance advanced technology so that they will be able to force these advanced technologies and put them in place. That could have tremendous positive effects in countries that at the moment use very old technologies. I think there is progress everywhere.

MR LLEWELLYN: In that case, of course, the world that we are potentially looking at is one in which, to the extent that greenhouse gas emissions are kept below what they would be on a business as usual basis, their price by one means or another is going to be higher than it would be without the policy. A tax achieves that; auctioning permits achieves that; but also regulations and standards polices do the same thing because they have to be paid for and that is passed on in the cost of energy.

The pressure for the two strands which you mention – conservation on the one hand and finding alternative energies on the other – is, in all probability, going to grow and grow rather fast.

Steve, you concern yourself with both. Do you regard them both as important? Do you look on energy efficiency as important as renewables?

MR WALSH: I agree. I think they go hand in hand but the reality is that we will not see a reduction in energy demand world-wide.

One of the difficulties is how to do a substitution and that substitution often comes at a price. Reluctantly, many people, when it comes to paying the bill, are reluctant to pay the natural increase in price that energy substitution sometimes requires. Usually on a national or regional basis a government makes a strong commitment and private industry and certainly the population falls in line. There is no better example than, say, Germany, which is the world leader in wind power. It is also the world leader in solar power. These substitution technologies come at a price but they are doing the right thing. I expect the rest of the world to follow suit.

At the same time, it is difficult when you have a developing economy that cannot meet the needs of its people or its industries and you tell them that they have to change technologies or pay a significantly higher cost for energy simply because they need to fall in line with, say, reducing their overall carbon footprint. That is sometimes a very difficult message that people do not want to hear.

MR LLEWELLYN: What order of magnitude are we talking about when you say it is more expensive to do it by renewables? Take your wind power, for example, where you are expert. How much more expensive is that?

MR WALSH: Really it depends. We have seen a significant increase in wind turbine costs in the last couple of years, given the relatively robust demand. We predict that to level out and come down a bit in two or three years. For example, if you have a wind park that can generate at a 30 per cent capacity factor, which means one-third of the time it is spinning and working, and you have say a fourth generation turbine of around 2 to 2.5 megawatts, that will probably double the cost of putting in a similar size of gas turbine that of course will run all the time as long it has fuel. Those prices, however, have come down significantly. As we see with solar power, solar photovoltaic technology has come down exponentially since there have been incentives to build solar parks. The solar technology has become cheaper and faster. You will naturally see that. One day you will probably see technologies in renewables come pretty close to matching those of traditional thermal based

generation, whether it be coal or other types of gas. That is going to be a while coming.

MR LLEWELLYN: I guess that is one of the hard things in this area. I have just myself come from a conference where we were talking about fuel efficiency, including in Europe. Of course the early attempts to bring down fuel efficiency, a type of conservation, looked as if they were going to be very expensive, implicitly pricing the carbon saved at a very high level, but the technology is moving very fast. Some people at this conference were saying that some of these technological developments now are going to be costly in terms of the cost of producing carbon, so they are moving very quickly. It is encouraging that it is moving in that direction.

Could I bring out one more theme? One of the things that you notice when you look at global projections of energy demand is that people say, "Can this not all be solved by nuclear?" or "can it not all be solved by renewables?" or "can it not all be solved by conservation?" All the global projections that I have seen say that we are going to need help in every area, that if you project nuclear at the greatest amount you can envisage, wind at the greatest amount you can envisage, and so on, there will still be a gap that will have to be filled by coal, and whether we like it or not, the next 20 years is going to see a lot more coal being burnt than at present.

Cristian, you have worked on coal. Do you share that projection and what are some of the implications you see?

MR CARRARETTO: You are right. It is also important clearly to understand that there is no single solution to the energy problem. We really have to use all the sources we have at our disposal. We need to mix them altogether. When we look at coal, the problem is there is a lot of variability of coal and the technology to burn coal in existing plants is rather basic. There are no mysteries to be solved in using it. Somehow there are no mysteries to be solved in reducing its environmental impact. Technologies are available world-wide; we have outstanding results in a lot of coal-fired power plants around the world – in Europe, in Asia, in the States and so on. We have outstanding results, even better than with gas-fired power plants sometimes when there were the conditions for a commitment to do more. Also, from a business

standpoint, it is not just a problem of complying with the regulations; there are marketing issues sometimes in doing more and doing a test case for everyone to see.

Generally speaking, the problem is that if you are going to implement this pollutant abatement system, it will definitely result in an increase in the cost of electricity. It very much depends on the basis from which you are starting. It must depend on the targets you want to achieve.

This really also affects your budget and your cost system. For instance, in talking about capturing the carbon emissions, this is not really available at the moment and the technologies at your disposal at present will result in a 60 per cent or more increase in energy tariffs. It will be difficult to implement this in the near future

MR LLEWELLYN: Let me make sure that I heard you right. If we were to go not only to cleaner coal but to carbon dioxide capture, you would imagine that raising electricity tariffs by 60 per cent?

MR CARRARETTO: By at least 60 per cent, but there is no large scale application at the moment. We are just running pilots at present. From the reports I have read, 2020 will be a really important year. By 2020 we will have our first large-scale demonstrations around the world. It is not reliable enough at the moment to go in this direction. If you are looking at other emissions – nitrogen oxide, sulphur and dust – these technologies really are available and there could be important results there. At the same time, the investment costs would still be higher and you will not get any revenue back from this.

In some countries recently there are also meaningless fines if you go beyond the national limits. There is really no pressure on the cost issues to become cleaner at the moment. It must depend on tighter regulations and greater government pressure to stress these issues and oblige the managers to become cleaner with what is available. Again, it is not a problem of research and demonstration; it is a just problem of investing better in cleaner energies.

MR LLEWELLYN: You are starting to come right to the nub of the question, are you not? I chaired a meeting in London recently on wind turbines and renewables. That discussion was a lesson to me because as I listened to the investors talking, I realised that they were not mentioning the European ETS price at all. I could not understand that. I thought: why is this not a factor in their discussions? Finally, I plucked up courage to ask them because I could see that they were looking for internal rates of return on their investment which were extremely high, in the 30s and even in the 40s, and they were seeking to pay off their investment in three or four years. I asked why this was the case and they said, "It is because we are uncertain about the regulations that are going to extend going forward". I found that curious because already the Commission had indicated that it was committed to this in the long term. They said that there was a lot of variation at the national level in the details of the subsidies, the feed-in tariffs and the way the policies were committed. They were being very cautious and wanting to pay off their investment very fast. Does that ring any bells with you, Steve?

MR WALSH: I think it certainly does. The difference between us and perhaps some other companies in the private sector is that we tend to make our investments into the long term. A lot of, say, hedge funds or private equity funds will look at making an investment and then exiting soon thereafter within two, three or four years. Consequently, because of the short tenor, they are looking for a larger return. We and other companies tend to take a longer term view. If we are going to come in, for example, and put in a wind park, we are probably going to look at an investment and stay there for 20 years. At the same time, we operate in 29 countries. If the economics do not work out in one particular country that we find attractive, to ensure that our stakeholders get the maximum return on their investment, we will probably go and look elsewhere.

I think it is natural that investors look to signals from the government to ensure that they can, assuming they do things correctly, have a return on their investment within a reasonable amount of time.

One of the biggest difficulties in the United States, for example, is the product tax credit for wind. The tenor of that, while it has always been renewed, tends to be

extremely short, so investors putting in a large wind park are looking at their production tax credit always with the fear that if, for some reason, Congress does not extend it, then their investment could be at risk.

MR REGLING: In that context, I think there is really a role for both sides. As you have stressed, governments have to play a role, particularly during the next 10 to 20 years, to get the process going, to subsidise where necessary, to give tax incentives, to stimulate research and development and to set a clear framework. It must be a medium to longer term framework because I can see that industry needs some certainty. In the EU, despite all the problems from the fact that the implementation happens country by country, there should be some certainty because it is not only the Commission that proposes these things but the European Council. That means the 27 Heads of State and Government endorsed this early last year. We are together now working on the implementation. There is no doubt about the perspective up to the year 2020. These are legally binding targets. The industry can rely on governments doing something to get there.

There is a clear role for government. In the EU things are probably more reliable because the decisions have already been taken as opposed to in other parts of the world. I would expect industry to do something as well and not just be looking to recover investment in two or three years, as you report, with rates of return of 30 to 40 per cent, which would mean paying for the investment in two or three years. I think industry must also see this as an opportunity because, as you have said, technological progress is enormous, much faster than we thought 10 years ago. Those who invest, who do the research and then invest, and who are the front runners and the early market entrants will then have a huge opportunity to make profits. Only doing things when there is absolute certainty that there could never be a loss is not my understanding of private sector industry. I expect governments to do their share, but I also hope that industry will do its share.

MR LLEWELLYN: Cristian, you spend a lot of time on the ground. What do you see at the moment in terms of the way the private sector is looking at this? Are they doing the same thing that Steve was reporting? Are you seeing cases where people are taking a longer view?

MR CARRARETTO: Yes, I would say so, especially when you look at investments on the environmental side of the story. If you are going to invest with a 30 per cent rate of return, you will not have any difficulty in making it work. The problem is that it would be harder to start an investment that would pay back in 20 years. Sometimes it might be easier if you start also additional businesses along with this. For instance, there are opportunities to use the bi-products. If you want to reduce dust emissions from a station, and you get this ash, somehow you might trade it. There are industries in many parts of Europe which started with dust being abandoned. That dust can be sold to construction companies and to businesses which create bricks. For instance, I live in Venice and one of the islands near Venice has been paved with bricks made from a big coal-fired coal station nearby. You can also trade this with the cement industry.

What usually happens in the more traditional stations is that this ash is dumped in an ash pond and just forgotten about for the future. If you are going to suggest using a cleaner and more effective technology, recycling industries will not be willing to do it, but if you suggest that more environmental technology can be used on this ash, it is more attractive to the recycling industries. You can make business out of this.

There are regulatory pressures but there might also be economic opportunities in going cleaner. The pay-back time may significantly change, depending on the way you move just beyond a piece of equipment. You may establish a more attractive business out of it.

MR LLEWELLYN: I suppose we have been talking in theory to some extent. Steve, can I ask you to be hard-nosed and concrete? Could you give us an example of a policy that has led to a good outcome as you would see it and, if you have got one, give an example of a bad policy which has not led to the right outcome, as a way of illustrating the range that we face?

MR WALSH: A good policy might be one of the things that is going on in California. We are requiring the government to buy a certain percentage of its energy from renewables. That has spurred a significant growth, and that is directed by the State of

California, not by the Government of the United States completely just yet, although I think honestly that is inevitable. They require the utilities to source a certain amount of their power from renewable sources, which in turn forces the utilities, whether it be solar or wind or perhaps small hydro-electric, to promote that type of industry; it forces those industries to react to the requirement that has been imposed. I think that is an effective type of policy. It certainly cannot be 100 per cent but it is a start.

I think the lack of a policy or one that does not work is where there is no incentive or requirement for energy conservation. That is probably the case in many countries, but here in Ukraine the incentive to save energy, to switch to more efficient, more clean forms of energy or energy practices is really pretty lacking. Failure to have that will probably indicate behaviour where people will not change. Industries will not change and seek a more efficient solution unless they are forced to do so by some overriding authority.

MR LLEWELLYN: Cristian, can I ask the same question of you? Can you give us any examples of these policies?

MR CARRARETTO: I would say that the best policy is to sign the Kyoto Protocol. We make business much more attractive if there are similar mechanisms that can be associated with projects to save energy or become cleaner. The worst policy I have seen is when for certain reasons, in cases where a power station is so important for the electricity transmission system, it has to go on regardless of its performance. When you allow these principles to exceed the environmental and emission limits, that is a very bad policy. You will never give signs of going in the right direction by doing that. The worst policy is to allow a dirty plant to run regardless of its impact. There are plenty of places I have visited recently where this regularly happens.

MR REGLING: I would fully agree that governments must take care of this. The other simple policy advice, and it was implicit in Steve's remark, is that countries should not try to lower energy prices artificially below world market prices because they think that this is necessary to protect the poor. This is clearly bad policy, far too expensive, and we see it happening in many countries, including here; energy prices must reflect world market prices. If countries are willing to raise domestic prices to

world market levels, the savings in the budget are so tremendous that some of these savings can be used much more efficiently to protect the poor.

MR LLEWELLYN: That is an important point, is it not, Klaus? Energy is a major part of the household budget, particularly in developing countries but in many countries. If all you do is raise energy prices, even though it is in the interests of reducing global warming and in the interests of economising on the use of energy, you have reduced the real income of households to an extent which they would find unacceptable. You have to return that money to them, in whole or in part, preferably nearly in whole. That means the design of the policy has to reduce income tax or it has to reduce value-added tax or find some other way of taking it back so that governments are saying to people, "We are not trying to make you poorer; we are just trying to make you consume less energy and in exchange you can consume more of something else". That is the argument.

MR REGLING: That is the more efficient policy, yes.

MR LLEWELLYN: Are we seeing that? Is there evidence that governments are capable of thinking in that way or is the risk that when they see a pot of money, they will say, "We want to spend it for our purposes"?

MR WALSH: I think governments, irrespective of where they are in the world, oftentimes are very concerned about staying in power; politicians are often very concerned about either being elected or being re-elected. I have seen this in the four continents where I have worked around the world, whether it be the United States, Latin America, European, Eastern Europe or Ukraine. It all pretty much acts the same; the political figures are oftentimes extremely reluctant to make difficult decisions, particularly when the impact is reflected on the voter. Consequently, people often know what the right thing to do is; the question is getting there. Politicians often need political top cover to allow them to make decisions that will not be completely held against them when they come up for re-election. That is the reality.

MR LLEWELLYN: I think we have reached the point where we have brought out some of the main issues. We recognise that energy prices are going to have to rise as a result of policy, as a direct consequence of policy, in order to give the signals to people to consume less, in order to give the incentives to industry to produce alternatives. In the market economies in which most of us function these days, those signals are the way we transmit that information.

We also recognise that there is a major equity issue involved in that, not only of course within our own countries, as we have said, but also between the developed countries and the developing countries. This equity question is going to be a major one in talking with China and India and other such countries if they are to be brought on board as well.

I think we have also brought out that the policy design is important, that it is not only going to be a matter of raising the price of energy but it is going to have to be done in a way that is credible, which gives the private sector confidence that they can engage in reasonably long-term investments and have a reasonable chance of having them paid back. I think those are the points we have brought out.

This would be a good moment to turn to you, ladies and gentlemen, in the audience, if I might. I am sure my fellow panellists will do their very best to answer your questions, whether those are the ones I have outlined or others.

(no microphone) future of nuclear energy in Europe ……

MR LLEWELLYN: The question is about nuclear power in Europe.

MR REGLING: I have said already that there is no clearly identified Commission view on this because our Member States have very different views. Some of our Member States actively promote nuclear energy and the building do new nuclear power plants whilst some other Member States are closing down nuclear power plants. In this particular area, there are very different views, not only by governments but by the population in these countries.

In my own country, Germany, the majority of the population just does not support nuclear energy. You may regret that from the aspect of clean energy because from the perspective of CO_2 emissions obviously nuclear energy is a good source. On the other hand, resistance arises from the fact that the storage of nuclear waste is an unresolved issue, and if people focus on that, they come up with a negative view. There is no common EU view on this.

Do not forget that the Euratom Treaty is one of the founding treaties of the EU and so there is money available under the Euratom Agreement. What the European Commission is trying to do with that money is to help existing nuclear power plants to become safer. This is particularly relevant in some of the new EU Member States in Eastern Europe and there are programmes for that. As for the degree to which nuclear energy should contribute to the topic we are discussing today, there is no one view.

MR WALSH: I certainly think nuclear energy is here to stay. I think nuclear energy is a smart investment. While it does not cover the entire energy requirements of any one country, failure to recognise the long-term cost of nuclear energy, which is surprisingly quite supportable and compatible as compared to other forms of energy, is irresponsible.

Recently, I had the opportunity to sit next to a woman on an aircraft. Everyone has their own, shall we say, cross to bear or their own pet project. Once she found out I was in the energy business and that we also do wind business, she was alarmed and pointed out to me how many birds are killed by wind turbines. She thought that was absolutely horrible. I pointed out to her that two studies have indicated that domestic house cats kill between eight to 10 times more birds than wind turbines. If you follow that rationale, I said that we should eliminate all domestic house cats because they are worse than wind turbines. She thought about it and said, "Well, you are confusing the issue". Nuclear power is no different. Nuclear power has been around for over 50 years and, while expensive to construct given the new, modern technologies that we see in the light water reactors, I think that we can make it as safe as possible. Is it 100 per cent safe? No, but neither are wind turbines, particularly if you are bird perhaps.

There is a role for education to combat the idea that we will reject nuclear energy simply because the local population does not support. Once you really understand the benefits of nuclear power – again not for everything – with the proper safeguards and properly implemented, it is an important cornerstone of the energy diversification of any country or region.

MR CARRARETTO: I agree. I think we cannot leave it out of the energy portfolio. There are no reasons to do that. It is one thing if you already have the plant running and another if you are to build new power stations. You need to add together all the benefits and possible difficulties in introducing this technology. The decision is not that simple. You need to figure out how to introduce it and how to let it work effectively in a new market. It is not a straightforward decision. I agree with you that there are complaints about this technology. One takes care to address the problem of disposing of the solar panels once they are worn out. There is a lot of pressure against this energy source but we have to go through and make it viable anyway. I do not underestimate the life cycle associated with this.

MR LLEWELLYN: It is a base load issue of course but it is clearly going to be important in some countries though not all.

Let us have another question.

MR TERRY McCALLION: I am from the European Bank. This is a question mainly for Steve. Could you comment a bit about how you see the commercialisation of carbon capture and storage? In particular, how you see the technical challenges and risks and also how is your company is factoring carbon capture and storage into your business planning going forward?

MR WALSH: Carbon capture and storage is still in its infancy. As my colleague correctly pointed out, while in theory carbon capture has been around for about 30 years if you look at IGCC technology, the difficulty is that there is no long-term irrefutable proof that carbon capture and injection into aquifers or other places comes without a cost.

We certainly look at carbon emissions. That is a very big play for us. In fact we have devoted over $1 billion in our company alone into a climate solutions programme to reduce carbon footprints, do carbon offsets, eliminate greenhouse gases, et cetera. Part of the technology on the actual carbon capture is still nascent. Will it eventually come to fruition through more research and development? Certainly, but unfortunately that will probably require a significant commitment on behalf of the government. Most recently the United States Government, the current administration, decided to postpone funding for a future generation project that would probably have made great strides to further that technology of carbon capture and carbon sequestration.

You can do a little bit on the margins. We have a coal-fired power station in the United States in the State of Maryland. We vent off some of the emission gases and take the CO_2 that we capture, a very small percentage of the total, and we sell that to the local soft drink bottling company. They take the CO_2 that is produced as a bi-product of energy production through coal and use that as a resource in their business to make carbonised soft drinks. From a long-term perspective, it is probably still somewhat premature to look at that innovation going into an ongoing business plan.

MR CARRARETTO: It is one thing if you are going to retrofit an existing plant with carbon capture technologies and another if you are going to build a completely new one. In the first case it will always be more expensive. Carbon capture technology is better associated with the IGCC technology. We should address this mainly for new power stations. In that case, once the technology is commercially available, we also have the opportunity to obtain other products from the process. From the gasifier with totalization you can get methanol; you can use hydrogen in other systems; you can fuel the turbines directly with hydrogen. It will be a completely new market for the power industry.

The basic technology is available. We have experience in the oil industry, for instance, but for most applications you cannot think about 8,000 hours of operation per year in this case. It is not profitable; it is not yet reliable enough to have it at the

moment in the energy scenario. We have to wait for our young engineers to work this up and come up with feasible solutions as soon as possible. I guess it will take at least a decade. If important governmental funds are postponed, that will postpone everything.

MR LLEWELLYN: I would like to add that I find those two answers in a sense, globally speaking, deeply worrying. As I said at the outset, if you make projections for the next 20 years, however much you assume nuclear power grows, wind grows, conventional fuel use grows, and however much you assume that demand is reduced as a result of good policies, it seems you still end up with a growing wedge between supply and demand which can be filled only by coal. It seems inevitable on all the projections made at the moment by the International Energy Agency, by the private sector McKinsey and by the United States Government that they will all have a large and growing consumption of coal, which of course is so abundant in China and the US. In which case, if you make your projections of what is needed to keep greenhouse gas emissions from preventing CO_2 concentrations rising above the critical 500 parts per million by volume in the atmosphere, you reach the conclusion that you cannot achieve this unless you can sequester virtually all of the CO_2 from the new plants.

Then we have these gentlemen telling us: yes, the technology is coming along slowly, which is correct, but it is not coming along at the pace needed to do that. When you add to that the views of the United States Government and the British Government, which recently also decided to withdraw funding for its carbon capture and sequestration project, it seems to me that is one of the big policy failures that we risk facing going forward, that individual countries will not do it. Globally we do not have a body that would finance that research and development.

If there was one message I would love you to take back, Klaus, it is that that worries an awful lot of people I talk to certainly.

MR REGLING: And rightly so, I am afraid. From the EU perspective, I can only repeat what I said at the beginning. We are trying to be at the cutting edge, at the forefront, setting examples as to how to move and in which direction to move and

then we try to persuade our friends to come on board. Next year will be a crucial year in that respect. The problem exists because in the next 15 years world GDP in real terms will either double or go up by 80 per cent. Even on our baseline scenario where we have already built in an improvement in energy efficiency, my estimate is that world energy demand will go up by 50 per cent. If world GDP goes up by 80 to 100 per cent, that already implies substantial energy savings and more energy efficiency. The problem will not go away. Even with those savings, energy demand will go up by 50 per cent and so the CO_2 emission problem exists. We have to work on all these areas.

The one hope is what we talked about earlier, that technological progress will turn out to be faster than one believed *ex ante*. Our world has been characterised over the years by what we call globalisation but a large part of that is really that technology has changed the world economy beyond recognition over the last decades. This seems to be ever increasing in speed. There may be hope coming from that area. Again, governments have to play their role in providing incentives and stable frameworks. I hope that industry is innovative enough to use those frameworks and also willing to take some risks.

MR CARL HAHN: I am a private investor. I would like to give a word of caution about the wind industry. In Germany we are very proud of it but that pride is a little restricted to politicians. Wind energy has a capacity for use of around 10 per cent. It is the most costly waste we know in energy investment at the present time in Germany but it is very popular of course. If you really want to reduce CO_2 in the next 40 years the present move of the nuclear industry is the most important. We certainly have enough time to look at what to do with the conservation problems which are related to it. There has been some discussion about not having enough nuclear material for the industry, but the position is the same with oil. We always had only 40 years of oil left. Enough material is being discovered for the nuclear industry.

I am all in favour certainly of trying to reduce CO_2 but I think we have to be much more sober and realistic in this approach and get away from the day-to-day political opportunism that is governing the subject in too many countries.

MR LLEWELLYN: May I add a comment to that point? One thing that we may see, as the global policy evolves, is a movement of responsibility for these policies towards ministries of finance and treasuries, simply because the amounts of money involved are so vast. If that is true, of course they will be very concerned about the sort of point that you make, sir, which is to reduce carbon dioxide emissions in the cheapest possible way. I think we will probably hear more of the phrase "the social cost of carbon" in the future than we have done in the past. I certainly notice when I go to technology conferences that they will say, "We can do this, we can do that, we can do the other", but if you ask, "Yes, but at what price?" their reply is, "Ah, this is too important an issue to consider the price".

Of course, for a pilot study that is true; for a demonstration project that is true. Some of these technologies cost five or 10 or sometimes even 20 times more per tonne of carbon saved than others. While, as I say, that does not matter for a demonstration project, if you scale it up and say that 1 per cent of GDP spent on conservation would do us a lot of good and then say that we will do it by technologies which cost five times as much as they should, you are talking about spending 5 per cent of GDP to achieve the same ends. The difference between 1 per cent and 5 per cent is the education budget or the defence budget or something like that.

I think we are going to hear much more of your point, if I may say so from the Chair. There is going to be an increasing emphasis once we get out of the pilot phase study to doing this in the most economical way possible.

MR REGLING: You are absolutely right. If you look at these results and incorporate the cost aspect, of course it will not work; the amounts are just too big. That is why indeed finance ministries around the world are becoming more involved in this. You may not be aware that when the climate change conference took place in Bali last December under the auspices of the United Nations, 180 countries participated together with their environmental ministers. During that period there was a separate segment for finance ministers. The Indonesian host had invited the finance ministers from the 35 leading economies of the world. This was the first time ever that in the context of an overall meeting of environmental ministers finance ministers also had their meetings. They met for two days and it was agreed that this would become an

annual event. When, in December this year, the environmental and energy ministers meet in Poland, the finance ministers will again get together to look at the same issues.

MR LLEWELLYN: That is very clear. I had not realised it had gone quite so far. It is a logical follow-on from your point.

MR STEPHAN (RENUKE): I work at the Lviv Chamber of Commerce and Industry. My first question is to Steve. What do you consider to be the most interesting or prospective areas of investment for your company or coming from your sector, taking into account your experience from other countries and now from living in Ukraine?

My second question may be a follow-up on what you were asked previously concerning what is a good policy from your point of view for Ukraine. On the one hand, we have heard about the high cost of wind and solar energy. Taking into account that Ukraine may be one of the most energy-inefficient countries in the world, it might be logical to prioritise energy saving in Ukraine. If you imagine being the government of Ukraine, what would a good policy for Ukraine be in this sector?

MR LLEWELLYN: Steve, first: what is the best investment. Then, Klaus: what are the best policies?

MR WALSH: I would assume that you are referring to Ukraine and what the opportunities are in Ukraine and the region first and foremost. Certainly there is an opportunity to enter the thermal generation market if and when that is privatised. That certainly is attractive. Many of the thermal plants that I have been to could benefit from upgrades and improvements. I think that the efficiencies that you could get from those upgrades and improvements would be significant and allow you to pass benefits on to everyone involved.

MR LLEWELLYN: Would that be cost-effective?

MR WALSH: Yes, I think so. I was pleasantly surprised by a couple of the thermal power stations that I have visited here in Ukraine that were supposedly going to be

privatised, and that has been on and off. Whilst they used old technology, they were very well run. I can say the same for the nuclear stations. While there are no plans to privatise nuclear assets here, the nuclear plants that I have visited here have been extremely well run and impressive, as well run and as efficient as any US nuclear power station I have visited.

I think from an investor standpoint and also if and when Ukraine has a green tariff, that is a good area that we would look at. At the present time they are going through various iterations of a green tariff here.

The biggest problem Ukraine faces is, quite honestly, the over-abundance of energy that they do have. We have an impressive installed capacity here in Ukraine. We have nowhere near the peak demand for that installed capacity. Consequently, the incentive to diversify, improve and upgrade the current energy portfolio is often lacking.

I think energy demand will continue to rise and that one day you will see an interconnection between Ukraine and Eastern Europe. Instead of the 500-600 megawatts that are currently sold through the Burshtyn Island connection, you will see a more robust series of connections. Consequently, it will be very good to look at investing in the energy sector in Ukraine with the idea of exporting some of that energy into the Eastern European market as well as at more traditional green energy here, whether it be wind parks or perhaps solar, although I think the solar legislation here is probably going to be a bridge too far compared to other areas.

The most important thing that the Ukrainian Government needs to understand is that there are 180 other countries in the world. Unless they make the policy and the investment decisions to attract foreign investment, investors will take their money and put it elsewhere. That is the reality.

MR REGLING: That passes the ball to you. The other question was about energy efficiency. If it is correct that the Ukraine has the worst energy efficiency that must have something to do with the price signals that are not allowed to work. I am not an expert on the energy market in Ukraine but typically that is what it indicates, that the

price signals are not playing their role. We can see around the world a clear correlation that where energy prices are high, energy efficiency is good. This is not surprising to any economist. If something is expensive, people use it more carefully. That would clearly be one area to look at: prices seem to be too low.

As I said earlier, if prices are raised by the government, the money that comes into the budget can be used to protect the people who suffer and who cannot really afford the prices. That is a more efficient way of using public money. The other is by building codes imposing regulations on how houses and apartments are built so that energy is conserved. These are the typical responses you find in most countries.

MR LLEWELLYN: From my understanding, the amount of energy that is lost out of housing is often under-estimated in the popular imagination and certainly in many countries as much CO_2 is emitted directly or indirectly by one's house as by one's car.

MR GERHARD BURIAN: I come from the Ministry for Economics, Austria. We have an intense dispute about the high level of energy costs for our industry and especially in a global way. With regard to industry in Europe and especially in Austria, there are quite high standards of efficiency. We have received many complaints that the tremendous rise in energy costs is a major factor in investment decisions. In comparison, energy costs in Asia, India, China and South America are 60 to 70 per cent lower than in Europe. My question is: how do you safeguard fair international global competition on energy costs?

MR REGLING: Of course that is another reason why we need international agreements. In the long run the countries that subsidise their energy at the moment will not be able to do that for ever. Industries in countries that have to live with the market prices do not want to wait that long. The only way is, hopefully, to come to agreements in 2009, as we are trying to do, to address this problem. It does distort competition.

MR LLEWELLYN: It seems to me that the European Commission is walking a narrow road here because it wants to show an example to the rest of the world, and it has done so. It is fascinating to see the number of Americans, and in particular

American politicians, who come through Brussels to say, "Tell us about your good and bad experiences so that we can take this into account in designing our policies". That has worked from a European perspective, but it cannot go on for ever or else the competitive disadvantage would be unfair. When you compound that with a strong euro, it hurts like mad. That is why I hope from a global efficiency point of view that my 75 per cent figure is not too low.

MR VLADIMIR (STREGISH KARMARCO?) (Interpretation): I am from the Centre for Energy Efficiency. Ukraine does have quite a lot of technologies that it cannot use because we have a surplus of energy. We could offer those technologies to less developed countries. For example, if you take coal, we have (thin) coal but we have special automated combines that can develop coal, crush it to powder and that powder can be used to help clean oil leakages. Instead of using oil as the fuel in sea vessels, this powder could be used and in that case there would be no pollution of the sea. The vessels would be powered by this coal powder. We have many good, economic and efficient solutions.

What do you think is the obstacle to introducing new technologies in Ukraine? I have named just one but we have dozens of such new technologies that could be offered to less developed countries where they may not have the legacy of the old technologies. They could start afresh with new technologies that would be replicated in 10 years' time to more developed countries.

MR LLEWELLYN: Steve, that is a good question on which to end. Good technologies are available in Ukraine but they are not all in place and they could be made available to other countries. What do you think of that?

MR WALSH: Again, as the gentleman pointed out correctly, I certainly think that the significant energy surplus of installed capacity and the unwillingness by the government to adopt a meaningful energy conservation policy work against bringing on these new technologies. As it relates to pulverised coal perhaps in the maritime industry, I think, given the volume displacement and the difficulty, that is probably realistically a bridge too far. At the turn of the century we saw coal being used to fuel

ships. That was replaced, purely for efficiency, by natural gas, oil, heavy oil and in some cases certainly nuclear power.

I think with some of the technologies, particularly relating to photovoltaics and/or biomass, two areas in which Ukraine is very strong, it certainly has exportability round the world. It is just a matter of time I think before people realise that some of the technology can be applied.

Again, just because in Ukraine we have a surplus of energy, going back to the original point, we should not wait to adopt meaningful energy conservation methods. To wait until we are on the margin, so to speak, is irresponsible. It is irresponsible of the people of Ukraine and the government to think that. They need to take the steps now to conserve the energy that they have and make it more efficient.

MR LLEWELLYN: Thank you, Steve, and those are strong words to end on. We have reached the end of our time. I apologise to those of you who would have liked to ask questions and have not had the opportunity.

I would also like to thank my fellow panellists for having given you the benefit of their knowledge. I hope it helps. It has been a pleasure appearing before you. Thank you all very much indeed.