What Role for Coal in a Carbon-constrained World?

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Distinguished guests, ladies and gentlemen, it is an honour for me to address you this morning, here in this historic city of Dresden. I thank the organisers of the conference, the Clean Coal Centre Implementing Agreement, for this opportunity to be with you today.

The IEA acts as energy policy advisor to 28 Member Countries in their efforts to ensure reliable, affordable and clean energy for their citizens. We are sometimes referred to as the energy 'watchdog'. It was founded in 1974 by members of the OECD during the first oil embargo. The IEA's initial role was to co-ordinate measures in times of oil supply emergencies, like Hurricanes Katrina and Rita. The IEA's member countries are required to hold oil stocks equal to 90 days of net imports, which they may be required to draw upon if there is a supply emergency.

But as energy markets have changed, so has the IEA: its mandate has now broadened to cover the 'three Es' of balanced energy policy making - energy security, economic development and environmental protection.

So, with this brief introduction, let us now turn to the topic that I want to address today: what role is there for coal in a carbon-constrained world?

Notwithstanding the CO2 challenge that we are facing, we at the IEA believe that coal has a key role to play, one that indeed can be compatible with a low carbon economy.

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So, let's begin with a brief overview of the important role of coal in the energy sector. This slide provides an historical overview. Coal contributes significantly to power generation. Here we can see clearly the increased coal demand for power generation and how that has grown over the past 30 years. Currently, 40% of the world's electricity is generated from coal. For many countries such as Poland, South Africa and Australia as well as China and India, the proportion of power generation from coal is much higher; between around 70% to more than 90%.

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Here we gain an idea of the size of the coal-fired capacity in some of the major coal-using countries. In 2004, the coal-fired capacity in China was below that of the USA. But in recent years, China's economic growth has been largely fuelled by coal and this is evident from the increase in capacity over the past five years. Over the last 5 years, China has added an average 81 GW of coal generation capacity per year, this is more than the UK's entire existing coal capacity (76GW).

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And we can be quite certain that the importance of coal will continue through to 2030 and beyond. This graph shows world primary energy demand to 2030 in the 'business as usual' scenario, as published in the IEA's *World Energy Outlook* 2008.

It shows that primary energy demand will grow by 45% from 2006 to 2030; with an average annual growth rate of 1.6%. Non-OECD countries will account for 87% of global energy demand growth. Fossil fuels will account for around 80% of the overall increase in energy demand between now and 2030, with coal continuing to be the second most important energy source after oil.

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This increased reliance on coal, however, will lead to substantial increases in CO2 emissions. In fact, when we look at it, the energy sector accounts for more about 80% of global cO2 emissions and 60% of greenhouse gas emissions.

In the WEO-2008 business as usual scenario emissions from OECD countries are rather stable. An increasing share of these emissions will come from non-OECD countries. 97% of the projected increase in emissions between now and 2030 comes from non-OECD countries. Between 2006 and 2030, global CO2 emissions from energy will increase by 45% (to 40.6 gigatonnes, a growth rate of 1.6% per annum).

This trajectory of a 45% growth in emissions puts the world on track for a global temperature increase of around 6 degrees. This is catastrophic and not sustainable.

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In light of this grave CO2 challenge, the WEO-2008 set out an alternative energy policy scenario to take the world to a lower emissions future: This slides shows the "450 policy scenario" - a scenario to reduce CO2 concentration in the atmosphere to 450 ppm by 2030…. which will lead to a halving of emissions by 2050.

As you see, the reduction of CO2 emission from coal usage in both OECD and Non-OECD countries is the biggest contributor. This scenario requires an 'energy revolution'.

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This chart – based on the World Energy Outlook 2008 - shows what measures should be taken and where in 450 policy scenario. Let us be clear, this chart does not reflect financial flows, it only reflects where these technologies must be in place. First, 2/3 of emissions reductions must take place in non-OECD countries. This is because that is where the most economic growth will occur. GDP growth in OECD countries will be 2% per annum, but in non-OECD countries, it will be 4.8% per annum; more than double that of OECD countries. A green paradigm shift is required in these regions.

As you can see from this chart, in the 450 ppm scenario, measures in 3 areas are vital. Energy efficiency plays the largest role in reducing C02 emissions. Globally, in the 450ppm scenario energy efficiency represents 54% of CO_2 reductions. And when we look at non-OECD countries, this increases to 59%. This is enormous. Change to the energy mix through the use of RE and nuclear

power is also important. And CCS after 2020, particularly in China as well as in all countries with a heavy reliance on coal. This chart shows that CCS is particularly important in OECD countries – accounting for 21%.

The IEA is working now to disaggregate this data further, country-by-country or region-by-region. The IEA will make this analysis available to the UNFCCC negotiations that will be taking place this September in Bangkok.

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In total, power sector emissions need to be cut by 2/3 in the 450 scenario (relative to RS). In the end, the share of fossil fuels decreases while renewable and nuclear electricity generation increases.

Renewables would increase from the current world share of 18% to 40% worldwide in 2030 (39% in OECD+ countries and 44% in the rest of the world). And nuclear power generation would almost double to reach 5200 TWh in 2030.

On the other hand, coal almost halves its share from 41% today to 21% in 2030, but will remain one of the two largest electricity sources, along with hydro (22%). And, I would like to emphasize that even in this very ambitious scenario, the total capacity of coal power plants increases by 20% from today to 2030. In 2030, 30% of coal capacity needs to come from coal power plants with CCS technology.

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How can we improve efficiency so drastically? This is a snapshot of the global coal fleet operating in 2004. Based on the higher heating value of the coal, the average operating efficiency was 28.4%. Current best technology operates a little over 40% efficiency, depending on coal quality and ambient conditions.

So, what are the major reasons for the low average global efficiency? A substantial part of the operating fleet consists of aging, smaller units, and much of it is sub-critical. There has been a lack of good maintenance. And there has been a lack of coal quality control. There is a need for more effective coal cleaning and more efficient coal drying.

Even in the mid-term, substantial CO2 emissions reductions from coal generations are possible.

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I am pleased to say that the average efficiency of plants is improving.

Only a few weeks ago, I was in Beijing to launch our book entitled 'Cleaner Coal in China', which was created in close cooperation with China's NDRC (National Development and Reform Commission). For coal, China is particularly important and China has an opportunity and serious willingness to play a leading role in the development and deployment of clean coal technologies.

For example, the smaller, inefficient plants in China are gradually being taken out of service. In their place, China is constructing larger, much more efficient units. As a result, the average operating efficiency of power plants in China is increasing.

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Let us now have a look at the outlook for CO2 reductions from coal use. The global average efficiency of coal plants in 2004 was 28.4% on an HHV basis (Higher Heating Value). The EU average is around 36%. State of the art plants are at around 42%, depending on coal quality and ambient conditions.

Developments underway at present may raise efficiencies to the high forties, say 48%.Through replacement and upgrading, we can raise the efficiency of coal-fired plants significantly and reduce CO2 emissions substantially. This needs to be done and a lot of effort is focused in this direction. But this will not provide us with the deep cuts we need if we are to more than halve our CO2 emissions by 2050. Our analysis shows that widespread implementation of CO2 capture and storage is essential if we want to stabilise our CO2 emissions.

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The IEA has been emphasising the importance of CCS for some time now. But, still, we do yet not have a commercial-sized power plant with CCS. There are only four operational large CO2 storage projects in the world, and none of these involve integrated CO2 capture, transport and storage.

The challenges are not to be dismissed lightly. The technology is expensive and the energy penalty is high. However, we must rise to these challenges fully integrated demonstration plants are urgently needed.

At the G8 Summit in Japan last year, G8 leaders supported the announcement of 20 large-scale CCS demonstration projects globally by 2010, taking into account various national circumstances with a view to beginning broad deployment of CCS by 2020. The IEA has been asked to help identify these projects and provide a 'roadmap' on CCS.

We are working closely with other international colleagues to address the barriers to the uptake of CCS, and particularly with the CSLF (Carbon Sequestration Leadership Forum) and the Global CCS Institute.

We anticipate this Institute will have a very positive influence on the progress of the 20 large-scale demonstrations plants we have been calling for.

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The challenges for CCS becomes even greater in the context of the current financial crisis.

Power-sector investment, particularly in generating plants, is expected to be severely affected by financing difficulties, as well as by weak demand in almost all countries.

We estimate that global electricity demand could drop by as much as 3.5% in 2009 – the first contraction ever in demand since the end of the Second World War. So, weak demand growth is reducing the immediate need for new capacity additions. At the same time, commercial borrowing has become more difficult and the cost of capital has risen markedly.

Market commentators have suggested that as a result of the current economic situation new power plant orders could fall by up to 50% in 2009.

Uncertainty in climate change policy is further complicating investment decisions for coal power plants. For example, in the United States, plans for 8 642 MW of new coal capacity were cancelled during the first quarter of 2009, primarily as a result of regulatory uncertainty over greenhouse gas legislation.

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And investment in renewables-based power projects is falling much more than that other types of generating capacity, partly as a result of the improved competitiveness of fossil-fuel generation technologies with lower prices.

IEA estimates that renewable investments could drop by 38% in 2009 - although government fiscal packages may soften that fall.

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But the current crisis should be viewed as a global opportunity to ensure investment in cleaner, more secure energy future.

The IEA has been calling for a 'clean energy new deal' for many months now.

The current stimulus packages are an important first step but they are insufficient to get us 'over the line' to a cleaner, more sustainable energy future.

As an example, let us look at the investments in renewable power generation.

With respect to the 2009 bar in this chart, the blue part represents private investment we project will take place in 2009. The yellow represents private investment that we project will take place *because of* the stimulus packages. It is clearly not enough to achieve 450 ppm for renewable power generation.

G20 governments need to increase funds committed to renewables 6-fold – 6 times more - relative to their recent stimulus package announcements – while for the low-carbon sector as a whole, including energy efficiency, a 4-fold (4 times) increase is needed. This is a message we will be providing to the G8 Energy Ministers' Meeting and the G8 Summit this year.

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Let me conclude with the following remarks:

- Coal will continue to play an important role in the energy sector for many years to come. At the same time, we must reduce our CO2 emissions if we are to have a cleaner, more sustainable energy future in the longer term.

- Coal does not have to be incompatible with this goal.

- Through energy efficiency and CCS, we can continue to use coal, indeed we will have to if we wish to enhance our energy security.

- But the current economic and financial crisis is having a significant impact on these low carbon technologies. Four times more investment is needed, including in CCS and clean coal technologies.

- The current stimulus packages are an important first step for a 'clean energy new deal' but they are insufficient to get us 'over the line' to a cleaner, more sustainable energy future. Much, much more investment is needed.

- The IEA is therefore calling on governments worldwide to truly embrace a 'clean energy new deal'.

So, yes, we know that coal has a future but to ensure that future we must invest.