The Global Energy Outlook/Czech IDR 2009

Ambassador Richard H, Jones; Deputy Executive Director, IEA

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Ladies and gentlemen, good afternoon! I wish to thank the organisers for inviting me to this conference. This is my first visit to the Czech Republic since I took up my duties in the International Energy Agency last fall and I am very happy to be back in Prague.

I have been asked to talk about the Global Energy Outlook today.

But first please allow me to talk briefly about the IEA, and in this context I will also mention the In-Depth IEA review of Czech energy policy that will take place later this year. Then I will continue by providing an overview of the IEA's projections on energy prospects in the coming decades.

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The IEA acts as energy policy advisor to 28 Member Countries in their effort to ensure reliable, affordable and clean energy for their citizens. It was founded by members of the OECD as an autonomous agency within the framework of the OECD following the 1973 oil embargo and the ensuing oil crisis.

The Czech Republic joined the IEA in 2001.

The IEA's initial and enduring role was and is to protect the energy security of its members. In the beginning this was limited to coordinating measures to respond to oil supply emergencies. But as the world and energy markets have changed, so has the IEA: its mandate has now broadened to cover the 'three Es' of balanced energy policy making. In addition to energy security, we now have economic development and environmental protection as part of our core mandate.

At the same time, our very notion of 'energy security' is also expanding – while in the past we may have looked only at responses to oil supply disruptions, we now consider gas security, the availability of other energy sources, such as renewables and nuclear, and ensuring stable electricity markets as legitimate concerns for us to address. Energy security is also increasingly seen as being linked to the issue of environmental sustainability, climate change.

As such, the IEA's mandate goes beyond its traditional work on oil security – and yet oil security remains at the very heart of the Agency's work and vision.

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One way we fulfill our mandate to promote the energy security of our Member-countries, is to perform In-Depth Reviews of their energy policies. This is one of our core activities.

Each IEA member country is reviewed regularly, every four to five years.

It is a peer review, and the review team consists of experts from other IEA Member-countries and the IEA secretariat, the OECD Nuclear Energy Agency and the European Commission. The review team meets with government officials and representatives from industry, and other stakeholders; and assesses the country's energy policies according to the IEA's Shared Goals.

The Shared Goals are a set of energy policy objectives agreed to by all member countries. They support the broader goals of energy security, economic growth, and environmental protection.

The last in-depth review of the Czech Republic was released in September 2005. The team had visited the country in October 2004.

The next IDR visit is scheduled for the end of November 2009 and the release is expected in late 2010.

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Let me now turn to the Global Energy Outlook and start with energy demand.

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.

The analysis for this scenario was undertaken before the full scope of the current financial economic crisis was known so don't worry too much about the absolute numbers, which will soon be revised. However, we believe the general trends will not change significantly. The graph shows primary energy demand growing by 45% from 2006 to 2030; with an average

annual growth rate of 1.6%. This is based on an average annual economic growth assumption of 3.3% worldwide.

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 solidifying its position as the second most important energy source after oil. These developments are primarily the result of rapid growth in the use of coal in China and India.

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How are we going to produce all this energy that this scenario suggests we will need to keep the world economy growing? Let's take a look at World oil production by source. This chart shows that energy security is not only about finding oil to meet growing oil demand.

The light orange section of the slide shows that – in our 'business as usual scenario' - we must also invest so as to meet declining production from current fields.

The red arrows on the graph highlight that - because of declining production in mature fields – the gross additions needed to meet existing production levels to 2030 (45 mb/d) will far exceed the net additions needed to meet demand growth (20 mb/d).

In other words, just to keep the current level of production, we need gross additions of five times the current production of Saudi Arabia will be needed. If we are to also meet increasing demand, we will need gross additions of seven times the current production of Saud Arabia.

In fact, by 2030, two-thirds of world oil production will come from new fields that are either awaiting development today or are yet to be found.

This is enormous challenge, one that most of us feel is impossible. So what should we sacrifice? World growth or our current ways of producing and consuming energy? This is why the IEA has called for a global energy revolution. I'll speak more about this in a moment, but first allow me to speak also a little bit about natural gas security, which I know is important to Europeans.

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In January 2009, Europe experienced its worst natural gas supply crisis when a supply disruption coincided with extremely cold weather.

On the whole around 5 bcm were not supplied. Although most Western European consumers did not notice much if any change, some Eastern European residential users were forced to cut consumption, in particular in Bulgaria and other South Eastern countries.

This supply disruption taught us how very important supply response measures are and how quickly these measures are put in place.

In fact, governments responded to the supply cuts in a variety of ways. The use of storage was key, but diversification of supply routes and supply sources played an important role, as did market responses:

-- Italy used mainly storage to replace over 1 bcm of missing supplies. German and Austrian stocks helped supply their neighbors.

-- Germany, Turkey and Poland received additional Russian supplies through alternate pipeline routes – Yamal and Blue Stream – these measures took place immediately. LNG from external suppliers helped supply some markets in South Eastern Europe: Turkey and Greece – these measures took only a few days to be implemented.

-- Market response was rapid in Western Europe: exceptional gas flowed from the UK to the Continent while normal flows from the Netherlands to the UK were reduced, leading to a faster draw from UK storage. This took place immediately and enabled more gas to reach the Western European markets affected by lower Russian supplies such as France and Germany. Similar measures were implemented in Eastern Europe. However, it took days or even weeks to do so, in part because of less well developed pipeline connections.

Overall, the conflict highlighted that the first and most important defence against supply disruptions is a well functioning market that is able to respond quickly, preferably within hours rather than days, to changing market circumstances, and based on demand and supply fundamentals.

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The January crisis was a timely reminder of the importance of gas security. In fact, IEA Energy Ministers instructed us to increase our work on gas security, as far back as 2005, and again in 2007. This was in response to a realization that in the future, our Member-countries will need to import more gas, over longer distances, and that longer distances mean a greater probability of increasing interruptions to the flow of gas, not just from transit disputes, as occurred in January, but also from natural sources such as hurricanes, fires and accidents, as well as terrorism.

We see **three key elements** to enhancing gas security:

-- First, adhering to certain principles -- reliance on fully functioning markets, transparency of flows and stocks, don't crowd out markets with emergency stocks, for example;

-- Second, improved preparedness by individual countries, each of which should assess known risks, consult with industry and neighboring governments, and adopt contingency measures. This is one of big lessons from January;

-- Third, an enhanced role for IEA is important. Before a disruption, we can help Member-countries prepare, by gathering data, by running emergency response exercises, as we have long done for oil emergencies, by assessing member country preparedness and so on. When there is an emergency we can work with member countries individually, or collectively if appropriate, to address specific problems.

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Let's go back to the need for an energy revolution. Besides the simple question of supply, there's another challenge we are all facing: growing emissions of CO_2, which is linked to the threat of Climate Change.

The energy sector accounts for about 80% of CO_2 emissions, and 60% of manmade greenhouse gas emissions. In our World Energy Outlook 2008 reference scenario, emissions from OECD countries are rather stable. But, an increasing share of global emissions come from non-OECD countries, as the green section of the chart shows.

In fact, global CO_2 emissions from energy will jump by 45% between 2006 and 2030 to 40.6 gigatonnes (growth rate of 1.6% pa). This trajectory of a 45% growth in emissions puts the world on track for a global **temperature increase of around 6 degrees Celsius**. This is clearly not sustainable.

If you look at the middle of the graph, you can see in this slide that the use of coal in non-OECD countries is the single biggest contributor to CO_2 emissions and its share will increase considerably over time, unless we act.

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In light of this pressing challenge, in last year's World Energy Outlook, we set out two alternative energy policy scenarios. One would take the world to a lower emissions future leading to a stablilization of greenhouse gases in the atmosphere at a level equivalent to 550 ppm of CO_2. The second, more ambitious scenario would reduce this stabilization level to 450 ppm. By the way, the 450 ppm scenario would still mean a temperature rise of around 2°C. It would also eventually lead to a 50% reduction of current levels of CO_2 by 2050, which is a target often mentioned for the Copenhagen talks this December.

This graph shows trajectories for energy-related CO_2 emissions to 2030 in the 450 ppm scenario, compared to emissions in the business as usual reference scenario. In both cases, we assume 3.3% world economic growth. So, in a way, the 450 ppm scenario shows us a way to decouple economic growth from CO_2 emissions. This will be important for

persuading developing countries, which are adamant about the need to continue their development without delay, to join in any agreement to limit emissions.

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So how can we bring about this decoupling of growth and economic growth? The bad news is that it's not going to be easy, but the good news is that we believe it is possible, and largely by deploying existing technologies or ones now under development. Here's the technology blueprint for this energy revolution from last year's Energy Technology Perspectives publication. It shows the contributions individual technologies can make to halving global emissions of CO_2 from energy use over the next four decades. It is a picture of a more rapid change in the world's energy system than has ever been seen.

This revolution will rely on deploying technologies in four main categories:

-- ***Improved energy efficiency.*** The biggest share of emissions reduction comes from an increase in energy efficiency. This will lead to 36 % of the overall reduction. It will require a *doubling* of the energy efficiency improvement, from that seen in the Baseline scenario. This will take huge efforts to achieve, but we know that energy efficiency is often the cheapest way of reducing CO_2 emissions and improving energy security, and in many cases can actually have net financial benefits. It really has to be the cornerstone of a more sustainable energy future

-- ***Increased deployment of renewable energy.*** The second biggest share is a massive further increase of renewable energy, which leads to 21 % of the overall reduction. By 2050 almost half of total electricity generation is from renewable energy sources, up from 18% today. Wind, solar PV, CSP, biomass and hydro, in particular, all have an important role to play.

--***Widespread introduction of carbon capture and storage.*** The third largest share of emissions reductions comes from the rapid and widespread introduction of carbon capture and storage (CCS), both in power generation and industry. This will lead to another 19 % share in the reduction. Due in part to the long life of boilers and power generating equipment it will not be practicable to completely phase out fossil fuel use for power generation and heavy industry over the next 50 years. Therefore, CCS (both retrofitted to existing facilities and incorporated as part of new plants) will be vitally important to reduce CO_2 emissions. The IEA is calling for twenty fully integrated, large-scale demonstration CCS projects to be operational by 2020.

-- ***Continued fuel switching.*** A major part of this is an increase in the share of nuclear. But, it also requires extensive fuel switching in industry from coal to low carbon fuels, such as natural gas. In later years, second-generation biofuels must become increasingly important in transportation.

Just because the energy system has never changed so fast before doesn't mean it's impossible. Far from it. We know the kinds of technologies that are needed, and we have some pretty good ideas about how to put them in place. But it won't happen without a lot of work, so now let's concentrate on what we need to do to ensure that we develop and deploy the technologies we will need.

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One of the tools that we are using to help organize the development and global deployment of cleaner energy technologies are technology "roadmaps", plans that review the necessary steps that need to be taken, the obstacles to those steps and how governments and businesses around the world might cooperate to overcome them.

The IEA is developing roadmaps for some of the most important low carbon technologies and here you can see a complete list. You can see about half of the technology groups being studied are concerned with the demand side, and about half on the supply side, and of those, half again are concerned with renewable sources of energy.

During 2009, we will present the global roadmaps listed in green (CCS in power generation, nuclear energy, solar PV, wind, electric/hybrid vehicles, and the cement industry). Further roadmaps, although probably not all of the ones listed, will be completed in time for the G8 meeting in Canada next year.

To prepare a roadmap, we bring together experts and officials from all concerned countries and sectors to lay out in detailed, practical terms what's needed — in terms of: technology, R&D investment, demonstration projects, deployment financing, policy and regulatory environments (which vary by country and region), international cooperation etc.

Some of the technologies needed to revolutionise the global; energy system by 2050 are not yet available for deployment (e.g. third generation ultra-high efficiency or ultra-low cost PV devices and fourth generation nuclear power). Many others require further refinement and cost reductions before they are fully commercialised (e.g. CCS and offshore wind). A huge effort of Research, Development & Demonstration will therefore be needed for both groups.

However, public spending today in IEA countries on energy research, development and demonstration (RD&D) is just some USD 10-11 billion per year, half the level in real terms that it was 25 years ago. Governments have made commitments to increase public RD&D and some countries have indeed increased investment, but overall goals have not yet been fully realized. Private-sector RD&D in energy technology exceeds public investment, at an estimated USD 40-60 billion per year (but only partly related to clean energy).

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Some may feel that a time of economic crisis is not the time to invest in energy RD&D. However, we disagree, and in fact, the IEA is calling on governments for a "Clean Energy New Deal". In other words, for them to focus economic stimulus packages on the development and deployment of low-carbon technology. So far, however, only around $100 billion or 5% of the total $2.6 trillion of public spending in short-term economic stimulus packages announced to date has been directed at energy efficiency and clean energy. Of this, only about $20 billion (*annualised*) is for renewable power investment.

Such amounts are significant, in absolute terms, of course, but much more needs to be done. We estimate that to implement our 450 ppm scenario successfully, we will need to increase annual investment in nuclear energy, renewables and energy efficiency by about $400 billion dollars, compared to recent levels.

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So although today's stimulus packages are helping, in terms of the investments needed to achieve the 450 ppm scenario, investment in clean low-carbon energy will need to be increased four-fold.

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Let me wrap up with a few final observations. The current financial crisis may be leading many of us to focus only on the short term and on the relatively 'relaxed' nature of energy markets at present. But this may be short-lived. According to our WEO and Medium Term Oil Market projections, oil demand in developing countries is still on the rise. Even if we can stabilise atmospheric concentrations of greenhouse gases at 450 parts per million, oil demand alone will reach around 90 mb/d in 2030.

Although we can't overcome structural problems like insufficient investment, the IEA will stand ready as always to bring additional oil and products to the market during emergencies that affect the oil supply of our member countries. We are also now looking into emergency policies for natural gas. As we saw in January, well functioning markets, diverse sources of supply and commercial gas stocks can cushion disruptions – but large stocks held for long periods would be very expensive.

To provide secure supplies of energy necessary for continued world economic growth, we need a global energy revolution. Reducing emissions of CO_2 to mitigate climate change is another huge challenge calling for a global commitment to revolutionize energy.

This global revolution will require us to develop and deploy new technologies. IEA technology roadmaps are an important tool for organizing this effort. Among the technologies we need to deploy, EE, renewable energy, nuclear and CCS must all play a major role. However, the **current economic and financial crisis is having a significant negative impact on low carbon technologies.** Four times more investment is needed

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

Thank you for your attention.