IEA projections cast grave doubt on Europe's aspirations to tackle global warming

Emission impossible?

Nobuo Tanaka, Executive Director IEA Photo: Alex Forbes

Europe's decision to take a leading role in international efforts to keep global warming to within 2ºC of pre-industrial levels is laudable - but is this aspiration feasible? The latest World Energy Outlook from the International Energy Agency gives some idea of what would be required. It looks a very tall order indeed.

By Alex Forbes

Despite the relative success of December's climate change talks in Bali, which are to form the foundation for a post-2012 'Kyoto 2' agreement, it looks increasingly likely that history will judge the results to be 'too little, too late'. True, in the European Union, policy-makers have taken a lead in addressing what the President of the European Commission, José Barroso, has called 'the great challenge of our time'. In January, the Commission is due to complete a set of legislative proposals for a ground-breaking integrated energy and climate change policy package that will put Europe at the forefront of international efforts to address climate change.

'The High Growth Scenario paints an even scarier picture of our energy future'

The key element of this new European policy package, however, will not be the contribution that it makes directly to reducing greenhouse gas emissions, important though that will be. A recent Commission document concluded that even if Europe were to meet all the ambitious targets it has set itself, 'global emissions would only be reduced by less than 5% compared to baseline'. What matters most about the EU policy initiative is the example it will set to others.

The policy initiative has been framed with that aim in mind. Speaking at the World Energy Congress in Rome in November, Barroso said: 'As the world's biggest importer of energy, and the second-biggest consumer, I think it was important for us to show a lead. On the basis of a Commission proposal, the heads of state and government of the 27 member states have committed themselves to a low-carbon energy future... It contained an ambitious, but achievable, headline target: to reduce EU greenhouse gas emissions by at least 20% by 2020 compared with 1990 levels - a target that we are keen to increase to 30% if other developed countries join us. This is an essential first step on the road to our ultimate goal: to reach a shared vision on reducing global emissions by at least 50% below 1990 levels by 2050. Nothing less will do if we are to limit global warming to 2ºC above pre-industrial levels.'

What is significant about Barroso's reference to a 2°C limit is that there is a growing international consensus that global warming beyond this limit is likely to lead to catastrophic and irreversible damage to the environment. What makes this worrying is that recent authoritative reports suggest that our chances of achieving this target are low - and worsening.

Global warning

If the mere publication of weighty reports urging us all to take urgent action to mitigate climate change was all it took to tackle the problem, we would have little to worry about.Over the past eighteen months we have seen the publication of the Stern Review on the Economics of Climate Change by the UK government, the Fourth Assessment Report by the United Nations Intergovernmental Panel on Climate Change (IPCC), and the 2007 World Energy Outlook by the International Energy Agency (IEA), amongst others - not least of course the influential documentary and book by Al Gore, An Inconvenient Truth.

The message emerging from these reports - and from the Nobel Peace Prize awarded to the IPCC and Al Gore - is that the earth's climate is changing, that humankind is highly likely to be the primary cause of these changes, and that urgent concerted international action is needed to limit the damage. A positive element of the message is that keeping global warming to within 2°C is both technologically and economically feasible. There is, however, considerable doubt about whether it will be politically feasible - and time is running out.

One reason why time is short is the time that it has taken to reach international consensus on the reality of climate change and its anthropogenic nature. The IPCC's Fourth Assessment Report, published in four parts over the course of 2007, has done much to dispel remaining doubts - but it has taken two decades for the IPCC to get to this point.

The final synthesis report, launched in the Spanish city of Valencia on 17 November, says that 'warming of the climate system is unequivocal' and that 'most of the observed increase in globally-averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas emissions concentrations'. It goes on to warn that 'anthropogenic warming could lead to some impacts that are abrupt or irreversible, depending upon the rate and magnitude of the climate change'.

Moreover, because of the timescales associated with climate processes and

Photo: Christine Mariner/Corbis

Greenpeace activist is calling for an 'energy revolution' at the World Energy Congress in Rome, November 2007. Photo: Manuela Susi

feedbacks, even if carbon dioxide (CO_2) concentrations are stabilised, some anthropogenic warming and rising of sea levels are expected to continue for centuries.

Worsening outlook

Another report that has increased the sense of urgency for is the latest IEA World Energy Outlook (WEO). Published annually and widely regarded as the most authoritative set of projections of long-term energy trends, the WEO looks at how demand and supply are likely to evolve between now and 2030 in a range of scenarios with differing assumptions about implementation of new energy policies.

What is shocking about this year's edition is that, despite the recent implementation of new policies, energy consumption in the base-case business-as-usual projection looks likely to be higher in 2030 than previous editions have projected. In other words, rather than making progress towards mitigating climate change, humankind is going backwards.

Launching the report in London on 7 November, the IEA's new Executive Director, Nobuo Tanaka, said: 'As I'm sure you are all aware, world leaders have made highly publicised pledges to take action to address concerns over energy security and climate change. Nevertheless, since this time last year, when my predecessor, Claude Mandil, launched the 2006 edition of the WEO, the long-term outlook has actually deteriorated. Projected global energy demand is higher than before and supply emission trends are worsening. Energy demand is rising unacceptably, with associated risks of supply interruptions, high prices, and damage to the environment.'

> *'The next ten years will be critical if we are to avoid irreversible damage to the environment'*

As the report's lead author - Fatih Birol, the agency's chief economist - explains in our interview on pages 10-12, the key messages to emerge from his team's data-gathering and analysis efforts in 2007 are:

- the global energy system is on an 'increasingly unsustainable path' which will lead to 'alarming consequences' unless action is taken to prevent 'unfettered growth in global energy demand';
- China and India are transforming the global energy system 'by dint of their sheer size and their growing weight in international fossil-fuel trade';
- achieving a transition to a more-secure, lower-carbon energy system will require the participation of all countries, especially the five largest emitters - the United States, China, Russia, Japan and India;
- new policies under consideration would make a major contribution towards achieving a more-secure, lower-carbon energy system; and
- the next ten years will be 'critical' if we are to avoid 'irreversible' damage to the environment.

Frightening picture

The WEO uses three scenarios: a business-as-usual case called the Reference Scenario; a High Growth Scenario which assumes higher economic growth rates in China and India than does the base case; and an Alternative Policy Scenario that looks at how new energy policies currently under consideration could affect outcomes.

The bad news for those enthusiastic about the contributions that could be made to mitigation of climate change by zero-carbon energy sources - such as renewables and nuclear power - is that in all three scenarios the world remains overwhelmingly dependent on fossil fuels: oil, natural gas and coal.

Coal, in particular, plays a much larger role in this year's projections than it has, which has unfortunate implications for CO_2 emissions.

The Reference Scenario assumes that there are no new energy policy interventions by governments. It is intended 'to provide a baseline vision of how global energy markets are likely to evolve if governments do nothing more to affect underlying trends in energy demand and supply, thereby allowing us to test alternative assumptions about future government policies'. It paints a frightening picture of what the world's energy economy could look like by 2030. There are major implications not just for the environment but also for the security of energy supply. Primary energy demand is projected to grow from 11,400 million tons of oil equivalent (Mtoe) in 2005 to 17,700 Mtoe, an increase of 55%, or average annual growth of 1.8%. This is 4% more than in the 2006 WEO, despite the fact that the 2007 Reference Scenario takes into account new policies adopted in the intervening time.

'The bad news is that in all scenarios the world remains overwhelmingly dependent on fossil fuels'

Energy-related emissions of CO_2 rise by 57% from 26.6 Gt (billion tons) in 2005 to 41.9 Gt, putting the world on course for probable global warming of around 6ºC above pre-industrial levels.

There are implications also for the investment needed to finance energy-supply infrastructure. It rises to $21.9 trillion (in 2006 dollars) - $1.7 trillion more than in the 2006 WEO, despite the projection period being a year shorter, mainly because of higher costs in the upstream oil and gas industry.

The High Growth Scenario, introduced for the first time in this new 2007 WEO, looks at the consequences of economic growth being higher in China and India than in the Reference Scenario. This paints an even scarier picture of our energy future. Global energy demand by 2030 is 6% higher by 2030 than in the Reference Scenario, while CO_2 emissions rise to 44.8 Gt, 7% higher than in the Reference Scenario.

So what's the alternative?

The Alternative Policy Scenario analyses the impact on global energy markets of the adoption of policies that governments around the world are currently considering to address concerns about energy security and climate change. 'The goal,' says the IEA, 'is to offer practical guidance to policy-makers about the potential impact and cost.'

In this scenario, primary energy demand is projected to reach 15,800 Mtoe in 2030, 11% less than in the Reference Scenario, an annual average growth rate of 1.3%. Energy-related CO_2 emissions reach 33.9 Gt in 2030, 19% lower than in the Reference Scenario but still 27% higher than in 2005.

'The policies and measures analysed in the Alternative Policy Scenario lead to a major shift in the patterns of energy investment,' says the IEA. 'Consumers - households and firms - invest more in energy-efficient appliances and equipment, while energy suppliers generally invest less in new energy-production and transport infrastructure, in response to lower demand, compared with the Reference Scenario.'

The result is that consumers spend $2.3 trillion more, helping to reduce supply-side capital needs by $2.7 trillion, or 12%.

While the Alternative Policy Scenario is an obvious improvement on the other two scenarios, it is still not sufficient to achieve the European Union's policy goal of limiting global warming to 2ºC above pre-industrial levels. The IEA estimates that it would put the world on course for probable global warming of around 3ºC.

'Clean, clever and competitive'

Over the past two-and-a-half years, the IEA has been working on a special project for the G8 group of countries, having received a mandate to do so at the G8 summit in Gleneagles, Scotland in July 2005. It was there that the G8 leaders pledged themselves to 'resolute action' to combat rising consumption of fossil fuels and related greenhouse gas emissions.

At the Heiligendamm G8 summit in 2007, the final declaration pledged that the participants would 'consider seriously the decisions made by the European Union, Canada and Japan, which include at least a halving of global emissions by 2050'. In other words, the G8, along with several major developing countries, is now seriously considering the need to limit global warming to the 2ºC maximum favoured by the European Union.

For this reason, the IEA has looked at what would be required to achieve that aspiration. In its latest reports, the IPCC sets out a range of greenhouse gas emissions scenarios that forecast what temperature rise above the pre-industrial level various levels of greenhouse gas concentrations would lead to at equilibrium. In the most ambitious of these, a concentration of carbon dioxide and other greenhouse gases of 445-490 ppm (parts per million, expressed in terms of a CO_2-equivalent concentration) leads to a global mean temperature increase above pre-industrial levels of 2.0-2.4ºC.

In the WEO the IEA says: 'We estimate that stabilising greenhouse gas concentration in the range 445-490 ppm of CO_2-equivalent, the most ambitious of the IPCC's scenarios, would require energy-related CO_2 emissions to be reduced to around 23 Gt in 2030 - some 19 Gt less than in the Reference Scenario and some 11 Gt less than in the Alternative Policy Scenario.'

'In principle there are many ways in which energy-related CO_2 emissions could be reduced to 23 Gt in 2030. In response to requests from policy-makers, we describe here one possible pathway - which we have called the "450 Stabilisation Case" - to achieving this very ambitious target in order to illustrate the magnitude and urgency of transforming the global energy system over the projection period.'

The 450 Stabilisation Case requires cleaner and more advanced technologies to be deployed more quickly than does the Alternative Policy Scenario. Technologies that are not yet commercially viable - including CO_2 capture and storage (CCS) and second-generation biofuels, which are not included in the other scenarios - are assumed to be widely deployed. Moreover, it is also assumed that a proportion of existing energy-using capital is prematurely retired. The IEA adds that: 'Achieving this outcome would be possible only with very strong political will worldwide and at substantial cost.'

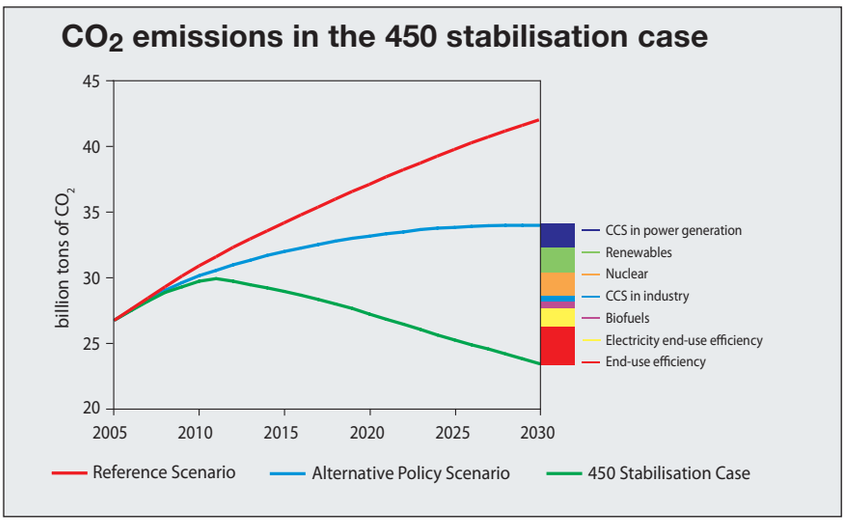
The accompanying chart shows how the CO_2 emissions trajectory of this case compares with the Reference Scenario and the Alternative Policy Scenario. It also shows the contributions that would have to be made by various technologies to emissions reductions below the levels implied in the Alternative Policy Scenario. The IEA estimates the additional investment costs required to achieve the 450 Stabilisation Case - over and above the $21.9 trillion required in the Reference Scenario - at $13.2 trillion.

So what are the chances of this 450 Stabilisation Case, or anything like it, actually being achieved?

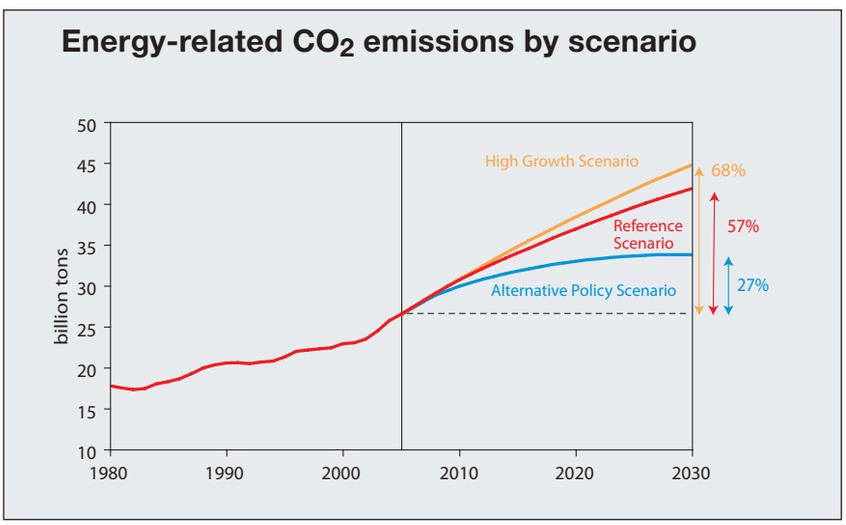
In the WEO, the IEA says that it could only be achieved if global energy-related CO_2 emissions were to peak in 2012, at around 30 Gt, and then decline to reach the goal of 23 Gt in 2030.

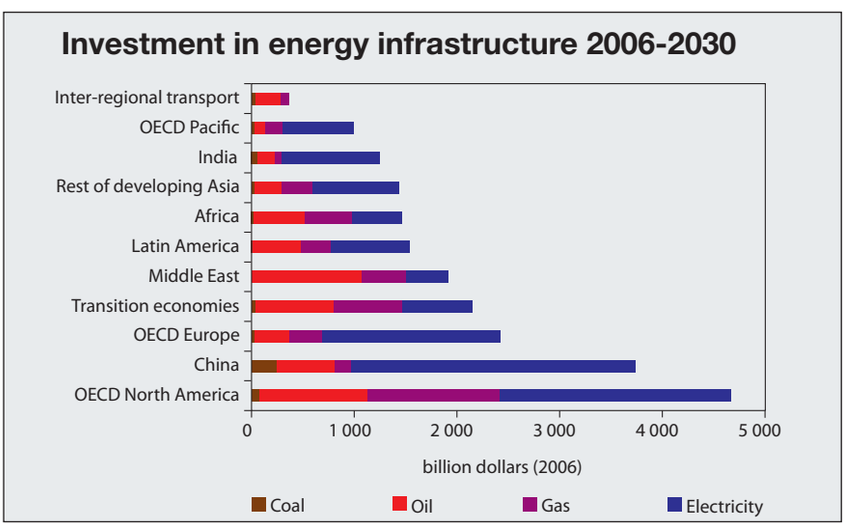
Returning to the talks that took place at the 13th UN Climate Change Conference in Bali last December, the hoped-for timescale is that negotiations for a new post-Kyoto emissions control treaty will be completed by 2009, in time for its provisions to be agreed at the 15th UN Climate Change Conference in Copenhagen (the 14th one is in Poland in 2008 and is described as a 'mid-way point'). That, says Barroso, 'would leave enough time for the new agreement to be ratified and in force before the end of 2012'.

Whatever the European Union proposes in its climate change and energy package this month, the chances of keeping global warming to below 2ºC are not looking good. ■



The graph above shows additional reductions in CO_2 emissions needed to go from the alternative policy scenario to the 450 stabilisation case and where these cuts will have to come from.





This graph shows the total investment needed in energy infrastructure to meet the forecasted energy demand as projected in the reference scenario.