Tapping technology’s potential to secure a clean energy future

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Good Morning, Ladies and Gentlemen,

I am delighted to be at the ONS conference this morning to discuss the clean energy future. It is a challenge for all of us, and one which Norway knows well. This country is also very familiar with the tough choices that need to be made, particularly when it comes to technology.

Norway is one of the foremost oil and gas producers globally, but its society recognises the need to tap clean energy sources. Its hydro endowment puts it at the forefront of power storage and renewable generation – as long as the rain falls, of course. Looking forward, Norway has the capital to invest in new technologies, as well as to invest in doing the “old” business of fossil fuel production in newer, cleaner and more sustainable ways.

Energy Technology Perspectives, or ETP, is a biennial publication that looks into where various energy technologies stand at the moment, and what they could do in order for us to reach a clean energy future by the middle of this century.

Midway through 2012, the challenges are clear:

• Energy demand and prices are rising steadily
• Energy-related carbon dioxide emissions have hit record highs of 31.6 Gt (2011)
• Energy security concerns are at the forefront of the world’s political agenda.

The first ETP was published back in 2006. Today’s political landscape is markedly different compared with six years ago:

• Evidence of climate change, if anything, has gotten stronger
• At the same time it has fallen further down the political agenda

Let me start by outlining some key messages coming from ETP-2012.
First of all, we believe that we still can reach a sustainable energy future. A wide range of technologies exist, or are in advanced stages of development, and can take us there.

Secondly, despite the potential of many clean energy technologies, the progress in deploying them is falling behind our ambitious goals.

Thirdly, a clean energy future cannot be achieved by looking into one or two technologies only. It requires a range of technologies and, even more than before, energy systems thinking.

Fourthly, we have strong reasons to believe that a transition to a clean energy future makes economic sense, right now.

And finally, government policy is critical to unlocking the potential of clean energy technology.

Before looking into the future, we should look back to where we come from.

A brief look into recent energy history tells us a very clear story:

- Our energy demand and the related CO₂ emissions have more than doubled in the past 40 years;
- We have observed strong growth especially in the non-OECD world in the past 10-15 years.

Our energy modelling also shows that despite best possible announced energy policy action by a large number of governments, our energy demand will continue to grow.

So we are truly facing very challenging times.

So looking into the future...

ETP 2012 looks ahead to 2050. It maps out a viable, affordable and efficient path towards a clean energy future.

We must choose among three dramatically different futures: a rise in global temperatures of 2°C, 4°C and a potentially devastating 6°C. We call these scenarios “2DS”, “4DS” and “6DS” respectively.

Crucially, ETP quantifies the prospect of attaining the international goal of limiting the long-term increase of the global mean temperature to 2°C: the pathway to sustainability.

- It also outlines policies, technologies and financing required to reach this goal.
- It examines the crucial interplay among policy, pricing and technology.
- And it provides tools and roadmaps, which we hope can serve as a valuable guide for policymakers to a sustainable future.

Governments have the responsibility to choose what future they want and start building the appropriate energy system now if that future is to be realised.

To have a chance to retain global temperature increase to 2 degrees Celsius, by 2050 the world needs to cut its energy-related CO₂ emissions by 50% from today’s levels. Considering population growth, we think this implies a gap of 24-42 GT of carbon to be dealt with by low-carbon technology.
However, progress with most clean energy technologies is not fast enough. 

So, are we on track to reach our 2°C goal? **The simple answer is: NO.**

- Some technologies, like mature renewable technologies like hydro, biomass, onshore wind and solar photovoltaic (PV) are **on track**. We have seen a 42% average annual growth in Solar PV and 27% annual growth in wind.
- Some technologies, like those pertaining to fuel economy, electric vehicles and industry are improving, but **more effort is needed**.
- And some technologies, like cleaner coal, nuclear power, carbon capture and storage (CCS), buildings and biofuels for transport are all **off track**.

Let’s be straight: **While ambitious, a clean energy transition is still possible.**

However:

**Action in all sectors is necessary to reach the 2DS target, and we also need to accelerate energy innovation.**

Against this backdrop, it is worrying to see the most recent development in public energy RD&D. While public RD&D hit a new high in 2009 as a result of economic stimulus spending, it declined sharply in 2010 to just above 2008 levels. Preliminary 2011 data suggest that spending may again be on the rise. But overall, the energy sector accounts for only about 4% of total government R&D spending, down from well over 11% in 1980.

This weakening support for energy R&D represents a major challenge, given the strategic importance of the sector.

Targeted RD&D efforts will help bring key early-stage clean energy technologies to market. Such measures must be coupled with policies aimed at fostering early deployment, which would provide opportunities for learning and cost reduction.

But action in all sectors requires an integrated approach. This year’s **ETP puts an emphasis on energy systems thinking.** We must look at a variety of technologies, and especially how they all play together. From an overarching technical perspective, the system-approach will need to emphasise flexibility and interconnection.

- Today’s system is centralised and unidirectional, while tomorrow’s will be decentralised and multi-directional.
- Complex and diverse individual technologies will need to work as one.
- Technologies must be deployed together rather than in isolation.
- Policies should **address the energy system as a whole** rather than individual technologies. **Systems-thinking will be an important element.**

Here I would like to commend Norway and the other Nordic countries for the steps already taken to integrate their energy markets, and for the efforts to optimise the whole system.
For example, Norway’s great hydro endowment provides large-scale capacity for energy storage unique in the world. That capacity in turn can be used to balance the entire regional system. This is the kind of approach that needs to be developed further and spread to other regions.

A linchpin of Nordic co-operation has long been a shared power grid. And indeed, the core of the future clean energy system is electricity.

Electricity allows for many modern necessities and comforts to be accessed, and its production can be decarbonised. Electricity can also be decentralised and allow for deployment to remote areas without massive grid investment.

At the global level, electricity consumption is doubled in the 2DS, but its production is largely decarbonised: 90% of electricity would in 2050 be produced by renewables, nuclear or CCS-equipped plant, and only 10% would remain from unabated gas, coal or oil plant.

Such a picture is true also for the EU.

Growth in EU electricity demand by 2050 is somewhat smaller than globally, but power production still increases by nearly 50% from today’s levels.

In the 2DS, the European electricity mix is also largely decarbonised. Wind, solar and hydro all play an important role. And, as you see from this picture, we also see a very important future for nuclear power in Europe, an area where Finland is currently taking important steps.

But even when it comes to European power, the IEA does not pretend that fossil fuels will go away any time soon.

For example, natural gas will continue to be key to electricity generation.

Where gas displaces coal – as it currently does in many markets - it carries great environmental benefits. Norwegian conventional production will find markets.

Indeed, consumption of natural gas for power generation is projected to grow in the 4DS and 2DS to 2030. But the two scenarios do look quite different after that, and the market for natural gas will become more crowded by unconventional production.

**In the 4DS** natural gas-fired generation increases strongly, mainly driven by economic growth in non-OECD countries. And unconventional gas production is projected to rise from 13% of global gas supply in 2009 to 27% in 2050.

**In the 2DS** natural gas-fired power peaks and then reduces:

- Between 2030 and 2050 global natural gas-fired generation decreases by around 30%, reflecting a concerted effort to drive power investment into low-carbon production.

- But natural gas power plants continue to be best placed to provide peak-load and back-up capacity to balance the variability resulting from renewable energy sources.

- And still, the share of unconventional gas continues to increase, reaching 24% by 2035 and 34% by 2050.
• But gas will not be enough. This slide shows average carbon intensity in power generation in selected regions. The two grey bands show the carbon intensity of two gas-fired technologies.

• It is clear that achieving the 2DS requires a transition from high-carbon to low-carbon generation. First to existing lower-carbon gas generation, where Norway is emerging as a world leader, but also beyond. Technological improvements will provide the reductions in carbon emissions after 2025. This requires continued development of more efficient technologies; the use of carbon-free fuels, such as biogas and hydrogen, and the deployment of carbon capture and storage, or CCS.

But in addition to the power sector, we also need strong improvement in other industrial sectors.

Energy efficiency will be the workhorse when it comes to carbon reduction. Although Norwegian industry is more efficient than in many other countries, there is still much room for improvement even here.

Looking ahead to 2050:

• Industry must cut direct emissions by 20% to help reach the global target of halving energy-related emissions by 2050.

• CCS is the most critical technology option for reducing direct emissions in industry.

• Reaching the 2DS target requires industry to spend more than USD 10 trillion in 2010-2050 on improved energy technology.

But though it will carry much of the burden, efficiency alone will not suffice to offset strong growth in materials demand. New technologies, with CCS again as a case in point, will be needed to help industry cut its emissions.

To achieve such development, governments need to:

• Support R&D for novel technologies to accelerate their development and commercial deployment.

• And promote standards, incentives and regulatory reform to ensure that the best available technology is used – in new plants in non-OECD countries – and when plants are refurbished in OECD countries.

I mentioned CCS. Indeed, whether in the industrial sector, or in the power sector, ETP sees a very strong role in the future for carbon capture and storage technologies. We see CCS delivering 20% of the total CO₂ emission reductions required until 2050.

In this field as well, I want to commend Norway for its leadership. The three CCS projects – one of which I have visited – are examples of Norwegian investment into cleaner and more sustainable fossil fuel production ... and they are moving the global understanding of CCS forward.
Of course when we discuss the transition to clean energy systems, arguably the greatest concern revolves around costs. Let me then touch on the economics of such a transition – particularly since this panel is about how we can unlock economic benefits.

A simple fact is that investment in clean energy needs to double by 2020 to limit the rise in global temperatures to 2°C. We need to spend an extra USD 130 per person every year on average on clean energy over the next 40 years.

But our calculations show that those investments make sense.

The cost of creating a low-carbon energy system now will be outweighed by the potential fuel savings enjoyed by future generations:

- By 2025, fuel savings from the transition would outweigh investments.
- By 2050 fuel savings could reach USD 100 trillion.

Every additional dollar invested in clean energy can generate three dollars in return.

The longer we wait to transform our energy system, the more expensive it will get.

Let me offer three key recommendations to policy makers from ETP 2012 to turn a clean energy future from aspiration into reality.

- First, we need to ensure that energy prices reflect the “true cost” of energy. That means pricing carbon and abolishing fossil fuel subsidies – fossil fuel subsidies which in 2011 were almost seven times higher than support for renewables. Both will help level the playing field for clean energy technologies.
- Second, governments can unlock the incredible potential of energy efficiency by adopting the IEA’s 25 energy efficiency recommendations.
- And third, we must accelerate energy innovation and public support for RD&D to encourage private-sector investment and more widespread commercial use.

In this way, we can turn affordable clean energy from aspiration into reality by tapping technology’s full potential.

These recommendations are ones we urge on all governments. But the modelling and work behind the ETP can have very specific regional applications, and we look forward to elaborating on ETP for the Nordic region in particular by early next year.

Let me close by pointing to a new component of the ETP project. On the IEA website, you will find a data visualisation tool that allows you to explore the scenarios in much more detail.

Friends – we are making tough decisions today which will define our energy future. Those decisions are taking place during a time of economic uncertainty, European crisis and austerity. But they are decisions which will go far beyond electoral cycles and quarterly reports.

We have the opportunity to set the stage for a veritable energy revolution – a revolution which reduces costs while meeting goals for efficiency, cleanliness, and access, on which we agree.
Technology is ever changing, and will go far to seeing that revolution in. But much of the technology is already here, and it will be up to us – our behaviour and the choices of governments and industry and society – to harness those technologies and realise such a future.

Thank you.