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**Energy Solutions for the Sustainable
Environment**

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(Introduction)

Mr. Chairman, distinguished participants. I feel honored to have the opportunity to contribute to this plenary session about energy solutions for the sustainable environment. The more so since our session builds on a shared conviction that the world needs to urgently transition from a situation in which energy is largely based on fossil energy to one that is increasingly based on renewable energy sources.

To accelerate this transition – which could still take decades - requires progress on three fronts:

- Development of new science and technology by universities, national laboratories and industry;
- Inspired Leadership of governments and world organizations such as the G8,
- (And finally) a radical change in energy consumer norms and behaviours.

(Three hard truths)

Let me say a few words about how I see the interplay between *Science and Technology in Society*, governments and consumers. I want to do this within the context of three hard truths we are facing today:

- The first hard truth is that energy demand growth is accelerating - driven by the predicted growth in world population from 6 to 9 billion people and a clear need to raise the living standards of a large fraction of the world's population.
- The second hard truth is that the supplies of 'conventional oil' will not keep pace with this increase in demand.

- The third hard truth is that in the next decades, continuing fossil fuel dominance in combination with higher coal use will cause increased levels of CO₂ generation.

(Energy Efficiency)

It is my conviction that the first response to these hard truths has to be an all out effort to curb the rise in energy demand. In addition to technological progress, this requires a radical shift in consumer norms and behaviours. To make it more personal, this is about the energy consumption choices you and I make every day.

Governments can do a lot to stimulate behavioral change through education, incentives, taxes, and standard setting. To mention an example of standard setting: In the residential sector, currently the largest consumer of energy, a McKinsey report argues that high-insulation buildings, compact fluorescent lighting and efficient water heating could reduce the demand growth in this sector from 2.4% to 1% per year.

The role of industry in curbing energy demand will be to offer technology based solutions that help people to save energy in a convenient way. Again to mention an example: In road transport, around 80 per cent of fuel is lost as heat. Lighter vehicles, more efficient engines and cleaner high-performance fuels such as clean diesel, biofuels, electricity, hydrogen or any combination of these will be needed.

The role of science will be to generate the knowledge needed to develop new concepts in areas such energy system management , new insulation materials, new mobility options, etc. I believe that there is also a major role for behavioural sciences to assist in the necessary shift in consumer norms and behaviours.

Having discussed the curbing of energy demand increase, let me move to the second response to the hard truths. This is that the

world needs urgently to complement conventional oil and gas supplies with supplies from unconventional fossil energy sources such as oil sands, coal and contaminated gas and low carbon energy sources such as solar, wind, bio-energy and nuclear. Admittedly, each of these new sources of energy has issues in terms of sustainability, economics and scale. There is no silver bullet amongst them.

An increase in energy supply will require a massive investment in science and technology and new methods of collaboration between industries and knowledge providers such as universities and state sponsored labs. There are clear signs that this is starting to happen. To mention two examples: First, my company – Royal Dutch Shell – has increased its technology investments substantially in the last few years as have the other players in the energy sector. Second, in the UK under the leadership of Dr King, a new Energy Technologies Institute is being formed with a potential budget of up to £1 billion over the next ten years that offers a collaborative vehicle for companies (large and small) and universities to accelerate the early deployment of new low carbon energy technologies.

The role of government in steering the efforts to meet growing energy demand is large. Again, wise policies and setting of standards are needed to drive the sustainability contents of the new energy supply mix. Additionally, there is a need for a step up in financial support to science and, very importantly, a step-up of funds to accelerate demonstration and early deployment of new technologies.

(Carbon Capture and Storage)

To complement the curbing of energy demand and the increase in energy supply, a third response to the hard truths has to be the large scale application of carbon capture and storage - in short hand, CCS. Hopefully, the use of this tool will only be needed for the period of transition to a more sustainable energy mix.

The main challenge here is not so much science and technology but creation of the necessary conditions to accelerate the implementation of CCS projects. In addition to review of permitting procedures, governments need to ensure that companies have reasonable economic incentives for sub-surface CO₂ storage.

Let me wrap up. To meet the energy challenge in a responsible way will require aligned action from governments, industry, science communities and consumers. I hope that in our conference we will define a few specific actions that will help to curb energy demand, to increase the energy supply and reduce the emission of CO₂ into the atmosphere. I look forward to our discussions.

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