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"Future Energy Policy – Creating Global Prosperity",

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Introduction

1. It is a great honour to participate as a speaker in this seminar. It is always good to be back in the University of Helsinki, my alma mater. This is where I learned my knowledge of Economics and Political Sciences – learnings which have proved invaluable throughout my career so far.

2. It's also a great honour because the Väinö Tanner Foundation occupies such a well-respected place in our national life, through its scholarships and grants for academia, as well as its programme of cultural events.

3. I have been invited to share a few thoughts today about energy and prosperity. My first observation is that prosperity is not only dependent on energy, but one of the principal benefits of using energy.

4. It is impossible to conceive of any aspect of life today without energy. From lighting and heating, from education to medicine, from transport to tourism, from growing food to growing old – energy is part of our lives, and is essential to our prosperity, and our ability to achieve and enjoy a high quality of life.

5. But a second and related observation is that billions of people across the world continue to face energy poverty and deprivation – for example more than 1.4 billion are still without access to electricity (IEA).

6. So the really important contribution that I see for energy companies like Shell is, quite simply, to make more energy available by developing a global energy supply that is secure, sustainable and affordable.

Global energy challenge

7. In the first half of the century global demand for energy could double, driven by a rising global population – 9 billion compared to today's 6.5 billion or so – and by economic growth in the developing economies.

8. China's GDP growth is running at some 10% per annum, while India and Brazil are not far behind. And it's this kind of growth that explains why China's gas consumption could treble by 2020. That is a powerful reminder of how rising prosperity is fuelled by energy consumption.

9. To keep pace with growing demand, the world will need to invest heavily in all energy sources, from oil and natural gas, to biofuels, nuclear power, solar and wind.

10. At the same time, we must urgently tackle greenhouse gas emissions. According to the consensus of climate scientists, CO_2 emissions should be limited to 450 parts per million to avoid levels of global warming with significant negative consequences.

11. On one estimate (Mauna Loa, Hawaii) we've already reached 390ppm and are rising by 2ppm a year. The clock is clearly ticking.

12. Over time, cleaner energy sources will meet a growing share of demand, as global efforts to tackle climate change gather pace.

13. However, there are significant technical and financial constraints to deploying alternative sources on a mass scale.

14. Our industry is very different to consumer electronics, where I have spent most of my career. Those businesses are under pressure to develop and market new mobile phones, for example, within 18 months.

15. In the energy industry, it takes around 30 years for a new energy technology to capture 1% of the market after commercial introduction. For example, despite spectacular growth, the share of liquefied natural gas (LNG) in the global energy mix is still only 2% - nearly 50 years after the first LNG plant came on-stream in 1964 in Algeria, using Shell technology.

16. Wind could secure 1% by the middle of this decade, some three decades after the first large wind parks were built in Denmark and the United States. All told, we think that by 2050, up to 30% of the world's energy could come from wind, solar and other renewable sources.

17. But fossil fuels and nuclear will still supply more than two-thirds of global energy.

18. In Finland, of course, we are ahead of the game – renewable energy sources account for around a quarter of our total energy consumption, we are world leaders in energy efficiency technologies, and we have a healthy nuclear sector. We also have an ambitious national target to increase renewables' share of total energy consumption to 38% by 2020. Nonetheless, we will still have a significant need for imported hydrocarbons in the years and decades ahead.

The contribution of the energy industry

19. Even with heavy investment in <u>all</u> energy sources it is going to be extremely tough for the world to keep up with rising demand.

20. For example, thanks to falling production rates in existing fields and rising demand, by the end of this decade the world needs to bring on stream about

40 million barrels per day of new production, from fields that haven't been developed yet. That's equivalent to about 4 times Saudi Arabia's output and 10 times that of the Norwegian and UK sections of the North Sea.

21. Against this backdrop, energy companies have three strategic "must do" challenges: to maintain massive investment, to promote energy efficiency, and to diversify the global energy mix.

22. At the beginning of this economic slowdown Shell decided to continue investing throughout the cycle. Each year to 2014, we will invest some $25-27 billion net in finding and developing new energy resources, and around $1 billion in R&D.

23. We have maintained this heavy investment to dampen supply volatility, plan for recovery and ensure we have more energy to meet demand in future years.

24. But we need others to keep investing as well. According to the International Energy Agency (IEA), the world will need to invest $1 trillion a year in new energy projects in the run up to 2030.

Energy efficiency

25. Energy efficiency is a second imperative.

26. I've just explained how global energy supplies will evolve over the first half of the century, as new energy technologies take decades to reach maturity.

27. By contrast, a near-term revolution in curbing energy *demand* is much more technically and financially feasible. In fact, energy efficiency offers governments and consumers one of the fastest and lowest cost routes to CO2 emissions reductions.

28. And it's critical that they take the opportunity to make immediate headway.

29. According to the IEA, efficiency measures must provide more than two-thirds of the emissions savings needed by 2020, for the world to be on-track to stabilising the long-term atmospheric concentration of greenhouse gases at 450 ppm.

30. Installing smart grids and energy meters, better insulation of homes and offices, lighter and smaller vehicles with more efficient engines, more efficient fuels and lubricants – these types of technological developments would all help to raise energy efficiency.

31. Much will also hinge on government regulations, such as the planned introduction of tighter CAFE standards to boost the efficiency of cars in the US. In passenger road transport, the average American uses three times the amount of energy as the average European, for various reasons. The CAFE standards could reduce consumption in this sector by as much as one-third - or some 2.5 million barrels of oil per day: an amount equivalent to about one-fifth of current *total* primary oil demand in Europe, across all sectors.

32. Using energy more efficiently would also bring significant economic benefits. To see why, consider that the cost of the European Union's oil imports grew by $70 billion last year on the back of higher prices – a figure equal to the combined budget deficits of Greece and Portugal (IEA).

33. Moreover, developing countries are attempting to lift hundreds of millions of people from poverty. So advanced economies have an additional responsibility to promote energy efficiency.

34. For the energy industry, too, efficiency only becomes more important. That's because the era of easy oil and gas is at an end. So the industry must tap more resources in hard-to-reach locations, which can be more energy-intensive.

35. It's also because our customers expect us to help them to conserve energy and reduce their CO2 emissions. At Shell, we've invested significantly to develop cleaner and more effective lubricants, which improve engine performance, and more efficient fuels. A recent example is Shell FuelSave petrol. The most advanced fuel economy product in the market, it helps drivers save up to one litre of fuel per tank, based on a 50-litre fill-up.

36. The third priority for energy companies like Shell must be to diversify the energy mix. That means developing and producing new types of energy – like biofuels, for example. In fact, of all the low-carbon transport fuels, biofuels can make the biggest contribution to tackling CO2 emissions in the road transport sector over the next 20 years.

37. But diversifying the global energy mix also means giving countries more choice, for example by developing natural gas as a cleaner-burning alternative to coal for power generation.

Natural gas – environmental and economic dimensions

38. The world is waking up to the potential of natural gas in a big way, for three reasons.

39. First, supplies are more abundantly available than in the past.

40. Second, new natural gas power plants are less costly and easier to build than any other source of electricity.

41. And third, the environmental benefits of natural gas are tangible, substantial and immediate.

42. The past few years have seen a spectacular improvement of gas supplies. It's not an exaggeration to call what is happening a supply-revolution. This revolution is built on two pillars: so-called "tight" gas – also known as "unconventional" gas - and liquefied natural gas.

43. Only a few years ago, it looked as if North America's domestic gas production would decline. Today, instead of declining, production has increased dramatically, as a result of advances in our ability to unlock the continent's vast "tight" gas resources. This is gas trapped in rock so "tight" that it seeps through the rock – at best – about a thousand times slower than it would through an ordinary reservoir. The resource base is now big enough to cover North America's current gas consumption for well over a century.

44. Worldwide, there's now enough technically recoverable gas in the ground for 250 years at current production rates.

45. The North American tight gas boom has also freed up liquefied natural gas supplies around the world – originally destined for customers in the USA – but now available for other markets.

46. By 2020, LNG supplies could meet one-fifth of global gas needs. More and more countries are joining the "LNG Club", with highly-condensed gas shipped as a liquid in massive super-tankers then 're-gasified' locally.

47. That strengthens supply security as it allows supplies to follow demand as it shifts and fluctuates around the world. After all, you can't easily change the supply source for a pipeline but you certainly can for an LNG import terminal.

48. This is important for EU countries with minimal or declining domestic gas resources. The world's growing LNG network will allow them to buy their gas from a diverse range of sources, including Qatar, Algeria and even the USA.

49. Growing the presence of natural gas at the expense of coal is the fastest route to CO2 emissions reductions in the global power sector. And for many EU countries will be critical to meeting their emissions reduction targets.

50. Natural gas is also faster and cheaper to deploy than competing sources of power.

51. Modern combined cycle gas plants emit half the CO_2 of modern supercritical coal plants, and 60-70% less CO_2 than the old steam turbine coal plants of which there are still many hundreds in Europe, America and China. Many of these will have to be decommissioned in the coming 5-15 years, and replaced.

52. And new capacity will have to be added to the system. By 2030, for example, Europe's electricity demand is likely to increase by around quarter on today's levels.

53. New gas plants are much cheaper to build than any other new-build source of electricity.

54. They require half the capital cost of coal per Mega Watt hour; one-fifth the cost of nuclear; and 15% of the cost of onshore wind, let alone heavily subsidised offshore wind. This front-end cost advantage is key for cash-strapped economies. Moreover, gas plants are also faster to install than coal or nuclear plants.

55. Natural gas is also a good fit for renewables based on intermittent sources of energy – when the wind drops, gas can be readily powered up to meet demand in the grid. I see gas-fired power with renewables as the perfect combined package for the future.

56. Indeed, a soon-to-be published study by McKinsey & Co (for the European Gas Advocacy Forum) confirmed that natural gas is the lowest-cost and most energy-secure option for reducing CO_2 emissions from power generation – and that investment today in natural gas leaves open other low-carbon options after 2030.

Natural gas – energy security dimension

57. Natural gas can make a big contribution to energy security in Europe. If we include Europe's domestic supplies, Europe is within reach of 70% of the world's gas proven gas reserves.

58. Europe is surrounded by huge sources of natural gas, in Russia, the Caspian, the Gulf region, North Africa, Nigeria and even the Caribbean. All this gas can reach Europe either through its well-developed and still growing pipeline network, or by ship as LNG.

59. There are still considerable domestic supplies of gas available. And new conventional supplies like Norway's Ormen Lange continue to be found and developed. And after 2020, domestic unconventional gas resources could also start to make a positive impact in Europe.

60. By 2030, around 30% of Europe's gas needs could be met through LNG. And import capacity through re-gasification plants is increasing rapidly.

61. Then, of course, there is Russia, which is investing in new fields and pipelines, and which will probably produce and export enough gas to satisfy around a third of Europe's gas consumption.

Carbon capture and storage

62. Carbon capture and storage – CCS – is another potential game-changer for curbing CO2 emissions in the global power sector.

63. The concept is relatively simply: trap CO_2 from power plants and heavy industry before it gets into the atmosphere, then inject it deep underground. For example, installing CCS in a gas-fired plant would reduce its net CO_2 emissions by 90%.

64. This option is as cheap, or cheaper, than retrofitting CCS for coal on for every MWh of electricity generated. And we would need to find less than half the CCS storage space, because of the lower emissions.

65. The IEA has said that if rapid deployment of CCS can start this decade, it could account for 19% of the total CO_2 reductions needed by 2050.

66. We are not only advocating CCS but delivering on it through our involvement with a number of projects that will help develop the technology.

67. The Gorgon LNG project in Australia, which will be operated by Chevron and in which we have a 25% equity stake, is the world's largest committed CCS project.

68. Funding for CCS was included in the Final Investment Decision. Up to 4 million tonnes of CO_2 a year will be separated from the natural gas during production and stored underground in a saline aquifer.

Government Policies

69. For natural gas and CCS to realise their full potential as lower carbon technologies, we need government policies that reflect their benefits.

70. Carbon markets are the most effective way to drive change and stimulate investment in low-carbon technologies. They put a price on carbon emissions and ensure efficient implementation of CO_2 reduction measures, starting with those that have the lowest cost and are fastest to execute.

71. Carbon markets need a sound architecture, both nationally and internationally. That structure exists today with the European Emissions Trading System, and it is the premise behind the Kyoto Protocol.

72. In such frameworks, natural gas, given its low carbon footprint, would be the most attractive fossil fuel for electricity generation. In combination with CCS, natural gas would also be a strong low-carbon competitor overall – and for the long term.

73. We must remember that CCS projects don't by themselves bring in revenues. So public financial support will initially be needed to help the technology to take off, just as the nuclear power industry required government backing in its infancy.

Conclusion

74. We live in a world full of transitions – the shift of financial and political power to China and the other BRIC nations, as well as the beginning of a long transition to low-carbon power and transport systems.

75. As we look at the many ways the world will change, one constant is that we will need more energy to enable continued progress and prosperity.

76. At Shell, we are focusing on areas that can make a big contribution to meeting these challenges – so much so, that from 2012 we will be producing as much natural gas as oil.

77. Future generations will first and foremost judge us by the speed and cost with which we reduced greenhouse gas emissions. Amid short-term political pressures and financial constraints on many governments, we must not lose sight of that.

78. Thank you for your attention.