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**Forecasting Supply and Demand  
up to 2030**



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**It is my great honour to make a presentation at this important meeting. In my presentation, I would like to begin with,**

- A. Global Energy Trends and**
- B. Asia-Pacific Energy Trends up to 2030.**

**A. *Global Energy Trends up to 2030***

*(Slide 1. World Primary Energy Demand)*

- World primary energy demand projected under the Reference Scenario is to expand by almost 60% from 2002 to 2030, with an average annual increase of 1.7% per year.**
- Fossil fuels account for almost 90% of the growth in energy demand between now and 2030.**
- Demand will reach 16.5 billion toe in 2030 up from 10.3 btoe in 2002.**
- Oil will remain the single largest fuel in the global primary energy mix although its share will fall marginally.**
- Demand for gas will be growing at 2.3% per year between 2002 and 2030. This is the fastest rate of any fossil fuel. By 2030, gas use will be 90% higher than it is now, and gas will have overtaken coal as the world's second-largest energy source.**

*(Slide 2. Regional Shares in World Primary Energy Demand)*

- Developing countries' share increases from 37% to 48%. This is mainly the result of a more rapid economic and population growth:**
- Their share of global demand increases for all primary sources, except non-hydro renewables.**

- **The increase is most pronounced for nuclear power, where production will fall in the OECD while expanding in China and other parts of Asia.**
- **Their share of world coal consumption has also increased sharply, from 46% to 61%, mainly because of booming demand in China and India.**

*(Slide 3. The increase in World Primary Energy Production by Region)*

- **I will now look at regional trends in production. Proven reserves of gas and coal far exceed cumulative amounts of both fuels that will be consumed over the period from 2002 to 2030. And more reserves will certainly be added.**
- **Proven conventional oil reserves today are sufficient to cover all the oil that will be needed until 2030. But reserves additions will be needed if production is not to peak before then. Key factor is cost.**
- **Non-conventional crude oil reserves are, in any case, very large and will replace any shortfall in conventional supplies as prices rise. Also, considerable potential for expanding oil production from gas-to-liquids plants.**
- **Sources of incremental energy supplies will shift markedly over the projection period (2002-2030), mainly in response to cost factors and the location of resources: that is to say over 95% of an increase in production will occur in non-OECD regions because most low-cost fossil-fuel resources are located in non-OECD countries.**

*(Slide 4. Cumulative Energy Investment, 2003-2030)*

- **Our global energy supply projections call for cumulative infrastructure investment of US\$16 trillion (in terms of year-2000 dollars) for the period between 2003 and 2030 to expand supply capacity and to replace obsolete facilities.**

- **The electricity sector will absorb US\$10 trillion - close to two-thirds future energy investment. More than half of the investment in the electricity industry will go to transmission and distribution networks.**
- **Total investment in oil and gas industry will each amount to almost US\$3 trillion, or around 18% of total energy investment.**
- **Coal investment is only US\$400 billion or 2.5% in total because of a much less capital-intensive.**
- **It is also worthwhile noting that developing countries will absorb about half of global energy investment.**

*(Slide 5. Inter-Regional Trade in World Fossil-Fuel Supply)*

- **International trade in energy will expand to accommodate the growing mismatch between the location of demand and that of production.**
- **Oil will remain the most traded fuel:**
  - **By 2030, 63% of all the oil consumed worldwide will be traded which is up from 46% in 2002 and the volume of oil traded will more than double.**

*(Slide 6. Oil Flows & Major Chokepoints)*

- **Therefore, the risk of an oil-supply disruption will grow as trade and flows through key maritime and pipeline chokepoints expand.**

*(Slide 7. World Energy-Related CO<sub>2</sub> Emissions)*

- **Global emissions will grow 62% between now and 2030 and developing countries' emissions will overtake OECD's in the 2020s**
- **As fossil fuels become increasingly dominant and as non-OECD countries increase their share of both energy production and consumption, CO<sub>2</sub> emissions will be affected:**

- In other words, 70% of the increase in global CO<sub>2</sub> emissions from 2002 to 2030 will occur in developing countries.
- The emissions in developing countries will overtake those in the OECD as the leading contributor to global emissions in the early 2020s.
- In 2002, developing countries were responsible for 36% of global emissions. This share will rise to 49% in 2030.
- Today, developing-country emissions are two-thirds of OECD emissions. However, by 2030, they will be 16% higher than OECD emissions.

*(Slide 8. Growth in World Energy Demand and CO<sub>2</sub> Emissions)*

- The average carbon content of primary energy will increase slightly through 2030 – in contrast to past trends.

*(Slide 9. Electricity Deprivation)*

- The IEA World Energy Outlook up to 2030 also pointed out that in 2030, if no major new policies are implemented, there will still be 1.4 billion people without electricity.

*Now I will take a look at the Oil Market Outlook*

*(Slide 10. Increase in Primary Oil Demand 2002-2030)*

- In oil demand, it is expected to see continued strong growth which is projected to grow from 80 mb/d in 2003 to 121 mb/d in 2030.
- Two-thirds of the total worldwide increase in oil demand comes from the transport sector.
- On one hand, the OECD oil use in sectors other than transport will hardly grow at all, and will even fall slightly in the power sector.

- **On the other hand, in non-OECD countries, industrial, residential and other sectors also contribute to higher oil demand.**

*(Slide 11. World Transport Oil Demand)*

- **Global oil demand for transport increases very closely in line with GDP up to 2030.**

*(Slide 12. Oil Market Implications of High Oil Price Case vs Reference Scenario)*

- **If we assume that crude oil price remains at an average for 2004, there will be major implications for global oil markets**
- **In such a High Oil Price Case, world oil demand in 2030 would be 19 mb/d, or 15%, lower than in the Reference Scenario.**
- **In the same High Oil Price, production in OPEC countries would be 24mb/d or 38% lower in 2030 compared to the Reference Scenario.**

*(Slide 13. Undiscovered Oil & Gas Resources)*

- **In recent years, the drop in oil discoveries is largely the result of reduced exploration activity in those regions with the largest reserves and of a fall in the average size of fields discovered.**
- **There are enough reserves to cover demand through to 2030. Nevertheless, considerable investment (US\$3 trillion) will be needed to ensure that these supplies are tapped and made available to consumers.**

*(Slide 14. Cumulative Global Oil Investment 2003-2030)*

- **Over 70% of the projected US\$3 trillion of oil-industry investment will go to the upstream – largely to replace exhausted capacity**

*(Slide 15. Access to Oil Reserves)*

- **In addition to investment, adequate access is a fundamental prerequisite for finding and developing adequate oil supplies. One key reason for the lack of major discoveries recently has to do with restrictions on access.**
- **The openness of those countries with large oil resources to foreign direct investment to develop their resources for export will be an important factor in determining how much upstream investment occurs and where.**
- **Overall, 60% of the world's proven reserves are difficult to access. Today, three major oil-producing countries, namely Kuwait, Mexico and Saudi Arabia, remain totally closed.**
- **However, plans are afoot in Kuwait to allow direct investment.**
- **Mexico has opened some areas to foreign oilfield services companies and may loosen its ban on direct investment in the future. Readiness to open up the Saudi upstream has so far been restricted to natural gas, but economic pressures could ultimately lead to some opening of the oil sector too. Internal political and socio-economic factors will determine the extent and pace of any such change in these countries.**
- **In order to develop fully and most efficiently the world's oil resources, broader access must be ensured.**

*(Slide 16. Oil Reserves Transparency)*

- **As I already explained, the Earth's oil resources are adequate until 2030 and beyond.**
- **However, less certain is whether sufficient investment will flow to the 'right' locations at the 'right' time**
- **Therefore, the IEA calls for improved oil reserve data transparency including a universally-recognised, transparent, consistent and**

**comprehensive reporting system and also a system of collecting, compiling and publishing primary data on national reserves.**

***I will now look at the Gas Market Outlook***

*(Slide 17. Proven Natural Gas Reserves)*

- **Gas resources are easily large enough to meet the projected increase in global demand.**
- **Proven reserves of gas have increased steadily since the 1970s, as reserve additions have outpaced production by a wide margin.**
- **Reserves are equivalent to 66 years of production at current rates. Were production to grow at our projected annual rate of 2.3%, reserves would last 40 years.**
- **Three countries, Russia, Iran and Qatar, hold 55% of global gas reserves. The former Soviet Union holds almost a third of global reserves and the Middle East 40%.**
- **On the other hand, gas reserves in OECD countries are small, at 18 terra cubic metres (tcm) which will be equal to 10% of the world total or 14 years of current production.**

*(Slide 18. Increase in Primary Gas Demand)*

- **Gas demand continues to be driven by the power sector:**
- **The power sector accounts for 60% of the increase in gas demand. This trend will be particularly marked in developing countries, where electricity demand is expected to rise most rapidly.**

- **Natural gas will remain the most competitive fuel in new power stations in most parts of the world, because it is the preferred fuel for high-efficiency combined-cycle gas turbines (CCGTs).**
- **A small but growing share of natural gas demand will come from gas-to-liquids (GTL) plants and from the production of hydrogen for fuel cells.**

*Now, let me turn to look at the Coal Market Outlook*

*(Slide 19. World Coal Demand by Sector)*

- **Coal will continue to play a key role in the world energy mix and virtually all the increase in demand will be for power generation.**

*(Slide 20. Major Inter-Regional Coal Trade Flows 2002-2030 (Mt))*

- **Industrialisation of developing Asia and the decline of coal mining in Europe contribute to the steady increase in coal trade.**

*(Slide 21. Australian Coal Exports and Share of World Trade, 1990-2030)*

- **As the only significant producer in the OECD Pacific region, Australia has the potential to greatly increase its exports.**

*Now, I will explain Nuclear and Renewables Energy Outlook*

*(Slide 22. Nuclear Plant Capacity Additions 2003-2030)*

- **Nuclear capacity increases in absolute terms but its share of the generation mix falls as new capacity is offset by retirements.**

*(Slide 23. Share of Non-Hydro Renewables in Power Generation, 1997 and 2002)*

- **Looking at the historical data for the period between 1997 and 2002, non-hydro renewables have yet to gain a significant share in the power-generation fuel mix in OECD countries.**

*(Slide 24. Share of Non-Hydro Renewables in Power Generation in 2002 and 2030)*

- **Their share will increase substantially through 2030, especially in OECD Europe.**

*I would now like to briefly touch upon Electricity Capacity*

*(Slide 25. Impact of Plant Age on OECD Electricity Capacity Requirements)*

- **OECD countries will need nearly 2 000 GW. More than one third of this new capacity will be built to replace ageing power plants in the region.**
- **In the OECD most existing coal-fired capacity will have to be replaced by 2030 and over one third of existing nuclear plants are expected to be shut down before 2030.**

**B. Next, I would like to address Asia-Pacific Energy Trends up to 2030**

*(Slide 26. Share of Developing Asia in World Incremental Energy Demand)*

- **Developing Asia achieved annual GDP growth of 6.8% in 1990-2002, and rising income in developing countries led to a surge in demand for energy.**
- **The annual growth rate of primary oil demand was 5.5% and electricity consumption leapt by 7.3% per year during the same period.**

- **By 2002, the region accounted for about a quarter of global GDP and of total primary energy demand.**
- **The region is projected to account for 42% of the increase in world primary energy demand looking at the period between 2002 and 2030.**

*(Slide 27. China's share of Incremental World Production & Energy Demand, 1998-2003)*

- **Booming industrial production in China is driving up energy demand and emissions.**
- **China has been responsible for a large share of the increase in world demand for raw materials – including energy – in the last few years.**

*(Slide 28. China Oil Supply Balance)*

- **China's primary oil demand will reach 13.3 mb/d in 2030.**
- **In 2030, China is expected to import almost 10 mb/d, as much as the United States imports today.**
- **China's import dependence will increase to 74%.**

*(Slide 29. Primary Fuel Mix in Japan & Korea)*

- **Total primary energy demand in OECD Asia (namely Japan and Korea) is projected to rise by only 1% per year from 2002 to 2030. The annual growth rate of demand will fall to just 0.5% in the 2020s, compared to 1.7% from now to 2010. This is primarily due to the penetration of more energy-efficient technologies and the decline in population.**
- **Among fossil fuels, gas will grow strongly. The power sector will account for 70% of the increase in gas demand. The share of gas in the fuel mix will increase from 12% to 18%, at the expense of coal and oil. Oil's share will decline to 41% by 2030. Nuclear energy is projected to increase by 1.7% per**

**year and its share in the fuel mix will rise from 15% to 18%. The projected growth rate of non-hydro renewables is highest, underpinned by government policy measures, especially in Japan.**

*(Slide 30. Primary Gas Demand in Japan & Korea)*

- **Gas demand in Japan and Korea will grow from 99 bcm in 2002 to 195 bcm in 2030, an increase of 2.5% per year.**
- **Trends differ between the two countries: demand will grow by 1.9% per year in Japan and by a whopping 3.9% in Korea.**

*(Slide 31. Change in Electricity Generation by Fuel in Japan & Korea)*

- **Electricity demand in Japan and Korea (OECD Asia) will grow by 1.3% per year between 2002 and 2030.**
- **Generating capacity needs to increase from 336 GW in 2002 to 503 GW in 2030.**

*(Slide 32. Primary Fuel Mix in Australia & New Zealand)*

- **Gas will replace coal by 4% in terms of share in total and oil will be the dominant fuel, underpinned by steady demand growth in the transport sector in Australia and New Zealand.**

**Next, I would like to touch upon the projections on CO<sub>2</sub> emissions, in the case where the new policies will be implemented.**

*(Slide 33. Japan and Korea CO<sub>2</sub> Emissions in Alternative Scenarios)*

- **With new policies, both Japan and Korea will stabilize their emissions in the 2010s and drive them back down to 2002 levels by 2030.**

*(Slide 34. China CO<sub>2</sub> Emissions in the Reference & Alternative Scenarios)*

- **On the other hand, with new policies, China could curb its CO<sub>2</sub> emissions by 18% in 2030.**

**Finally, I would like to make a short summary and conclude.**

- A. On current policies, world energy needs will be almost 60% higher in 2030 than now**
- B. Energy resources are more than adequate to meet demand until 2030 and well beyond**
- C. But projected market trends raise serious concerns, i.e.**
  - **Increased vulnerability to supply disruptions;**
  - **Rising CO<sub>2</sub> emissions;**
  - **Huge energy-investment needs; and**
  - **Persistent energy poverty.**
- D. More vigorous policies would curb rate of increase in energy demand and emissions significantly**
- E. But a truly sustainable energy system will call for faster technology development and deployment**
- F. Urgent and decisive government action is needed**
- G. Asia's importance to world energy markets – and its share in CO<sub>2</sub> emissions - will continue to grow**
  - **Most of the region's incremental demand and emissions will come from developing Asia – notably China and India**
  - **Energy demand will grow much more slowly in Japan and Korea**
- H. Net imports of oil and gas – and reliance on key chokepoints - will continue to grow**

**I. New policies would reverse the rising emissions trend in Japan and Korea, but not in developing Asia**

**That brings me to the end of my presentation and I would like to thank you for your attention.**