



Congress

***Innovative Technologies for Generating Electricity -
Towards zero emission coal fired and gas power plants***

Berlin, 10-12 May 2004

IEA World Energy Investment Outlook

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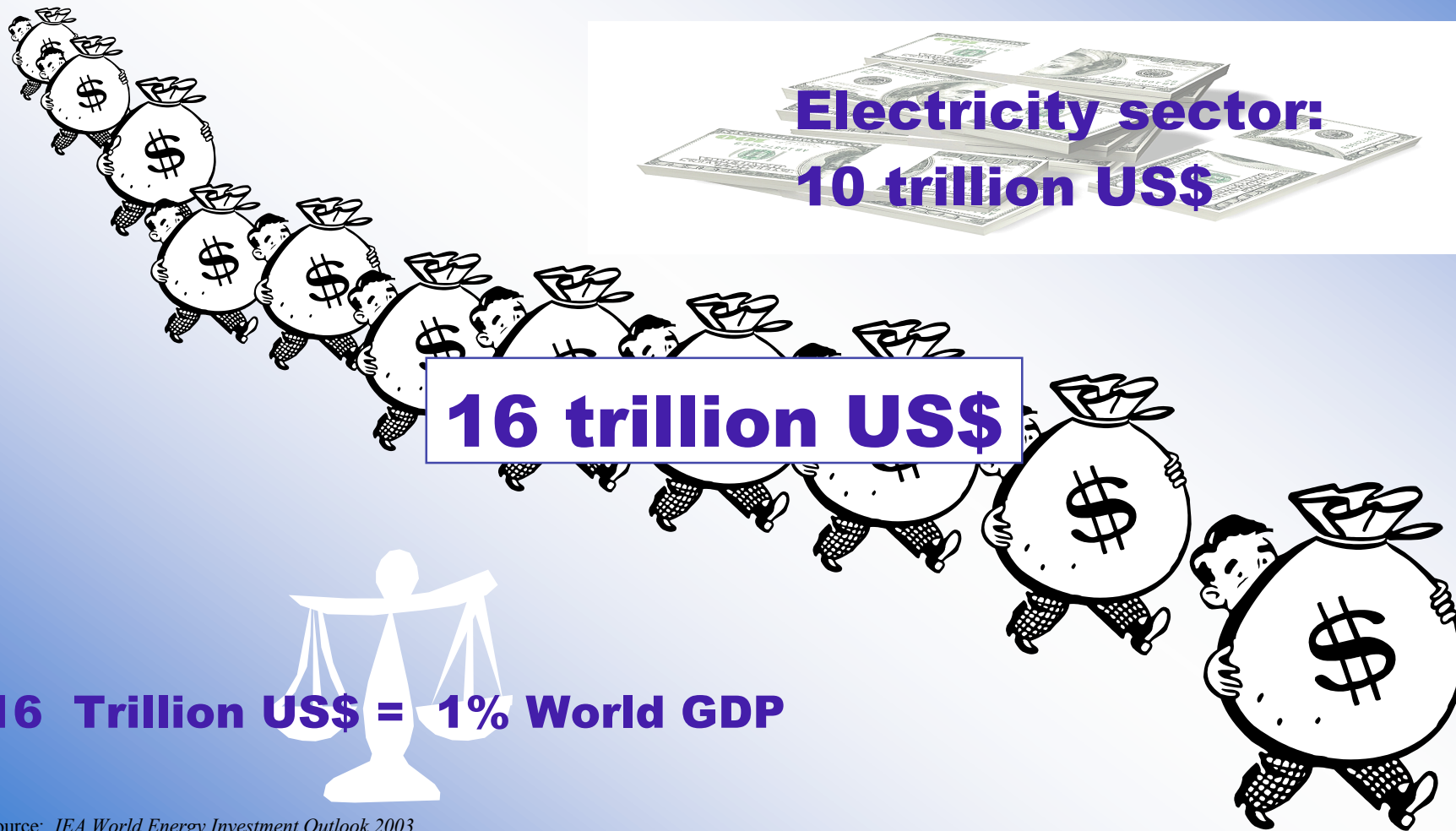


“...In an energy hungry world the challenge for coal, as for other fossil fuels, is to further substantially reduce its greenhouse gas and other emissions, while continuing to make a major contribution to economic and social development and energy security...”

World Coal Institute
The Role of Coal as an Energy Source



Worldwide Energy Supply Infrastructure Needs: 2001-2030

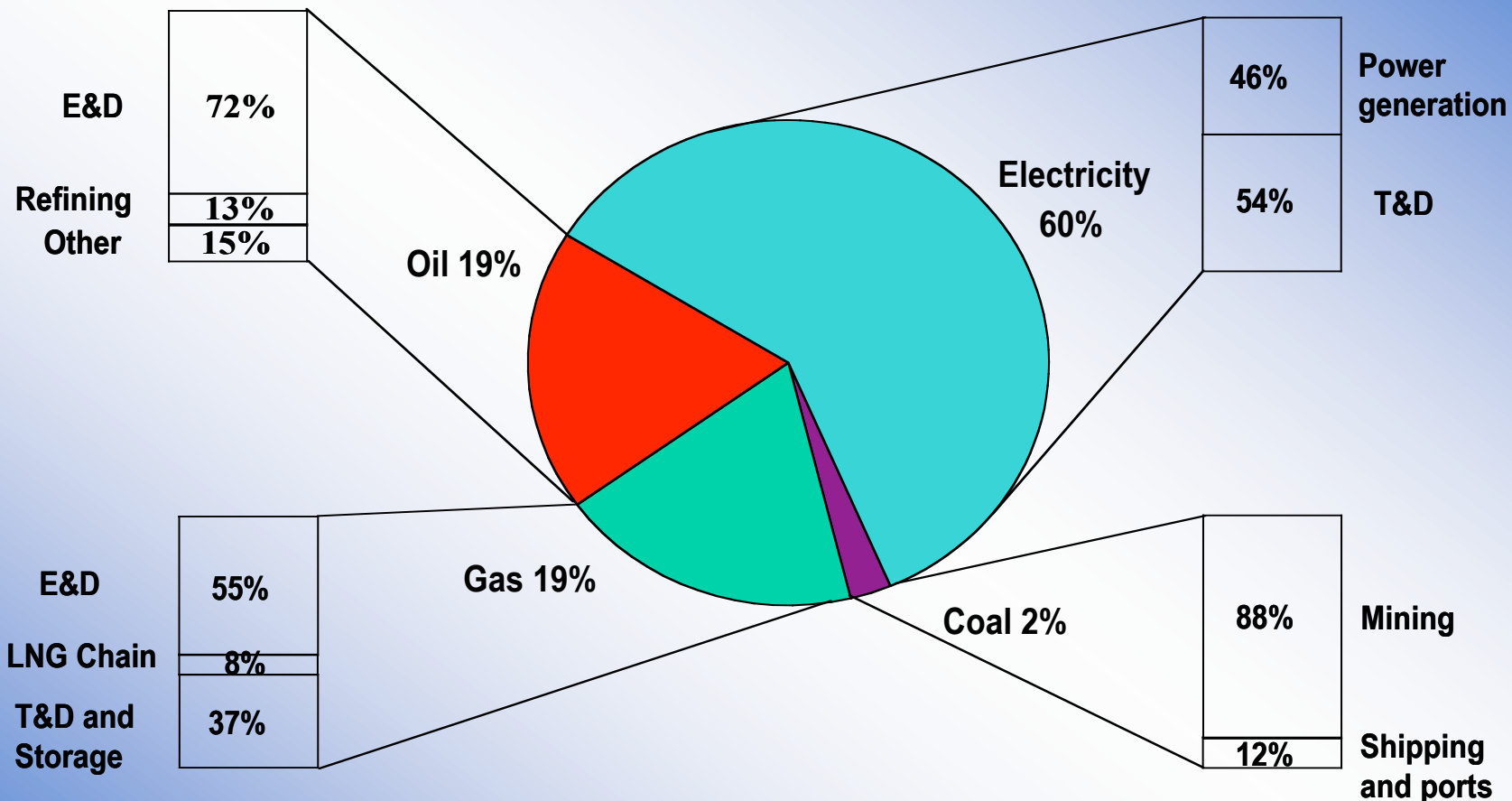


Source: IEA World Energy Investment Outlook 2003



World Energy Investment - 2001-2030

Total investment: 16 trillion dollars



Production accounts for the majority of investment in the supply chain – except for electricity

Source: IEA World Energy Investment Outlook 2003



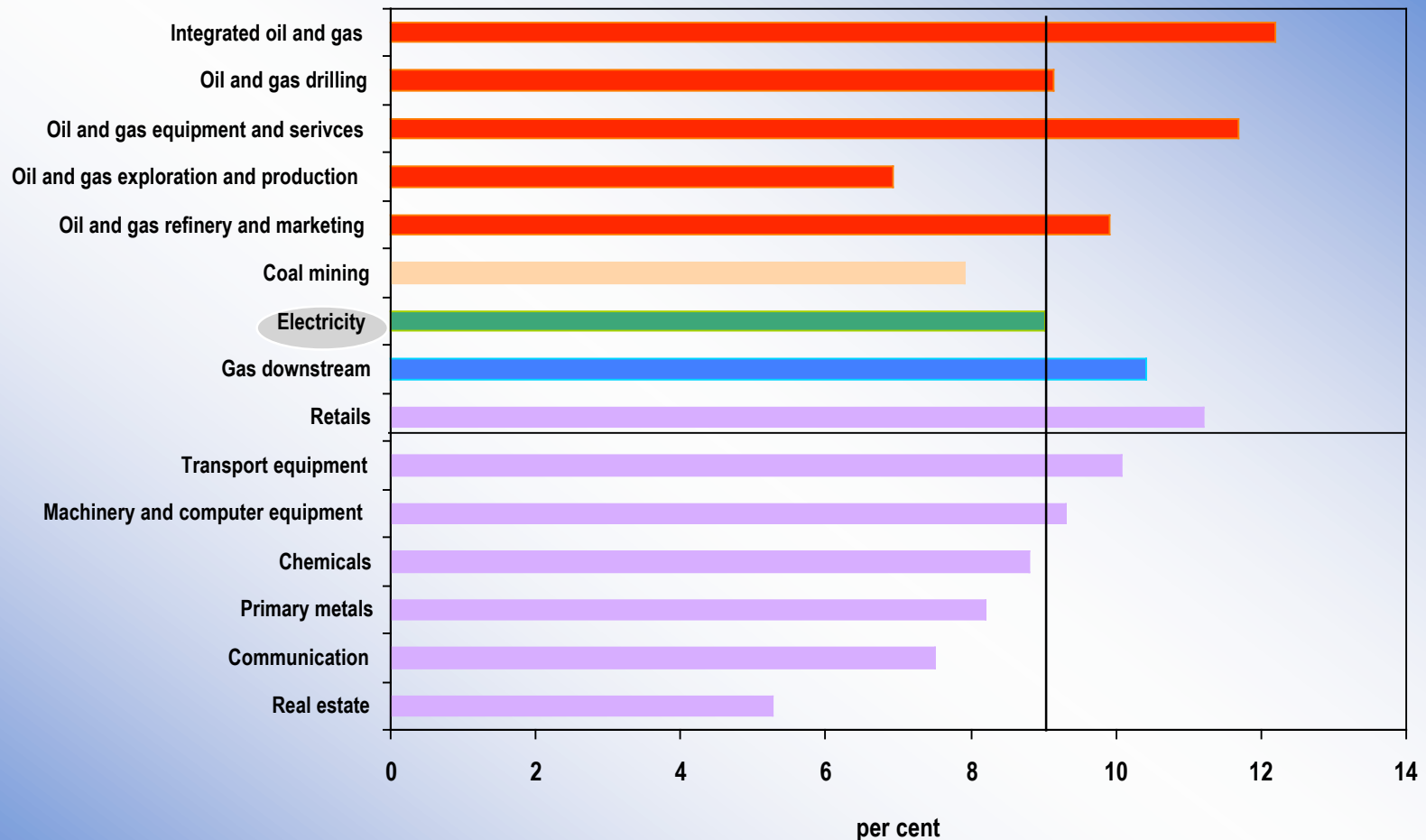
Major Power Sector Investment Challenges

- Market reform and competition
- Environmental constraints

Access to capital?



Return on Investment by Industry 1993-2002

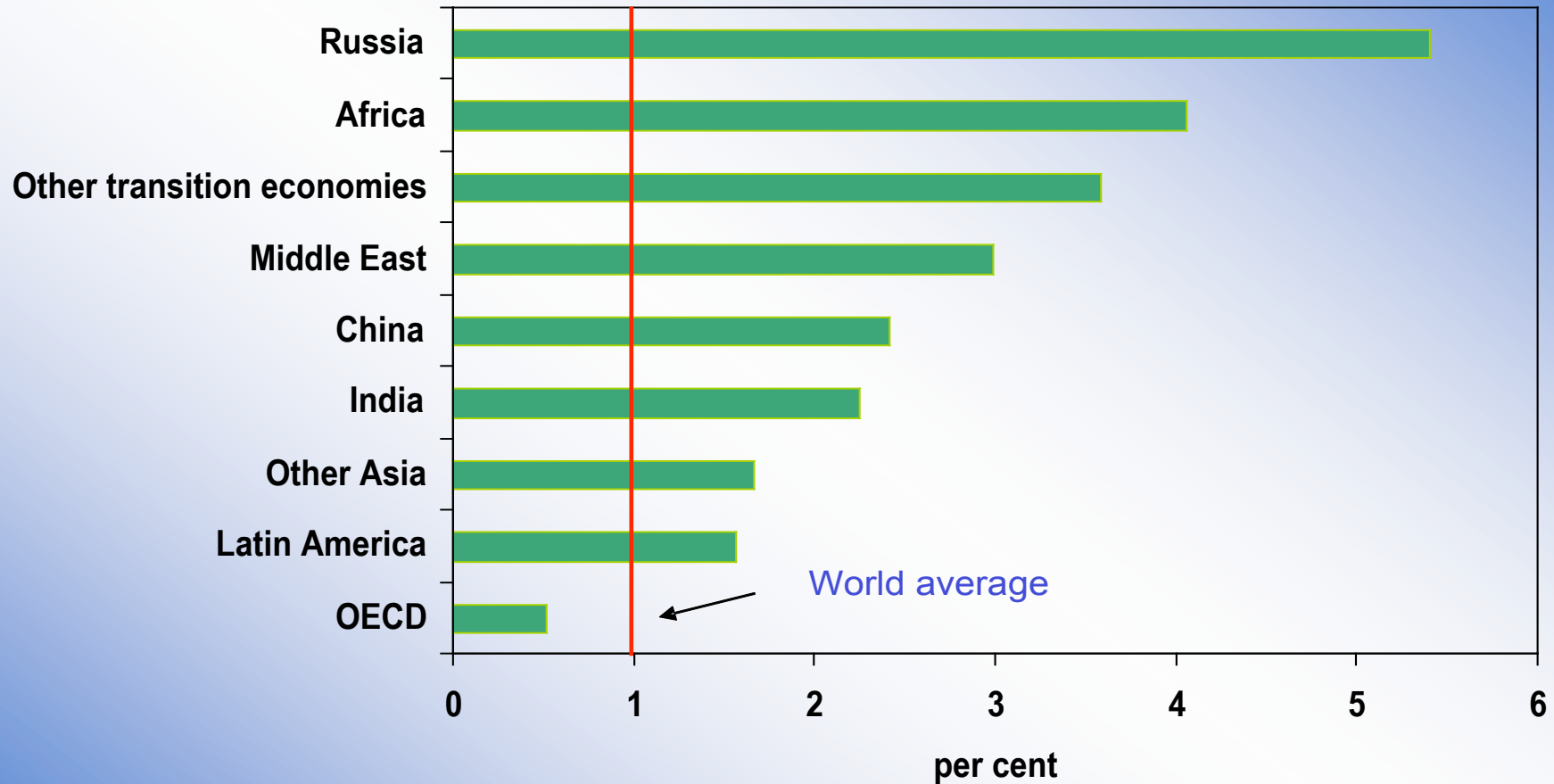


Upstream and downstream oil and gas industry returns have been better than rest of energy business & most other industrial sectors

Source: IEA World Energy Investment Outlook 2003



Energy Investment Share in GDP 2001-2030

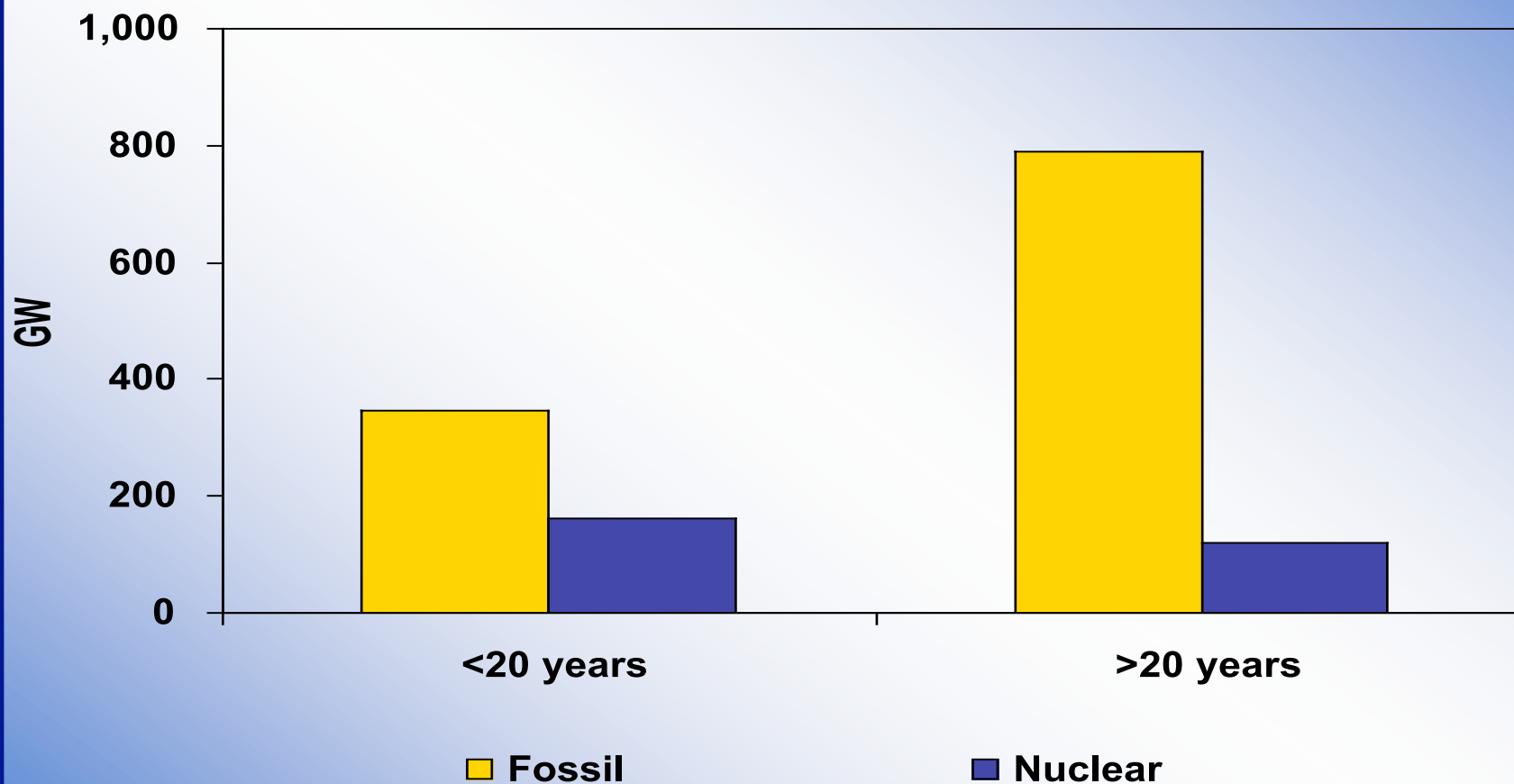


The share of energy investment in the economy is much higher in developing countries and the transition economies than in the OECD

Source: IEA World Energy Investment Outlook 2003



Average Age of OECD Power Plants 2003

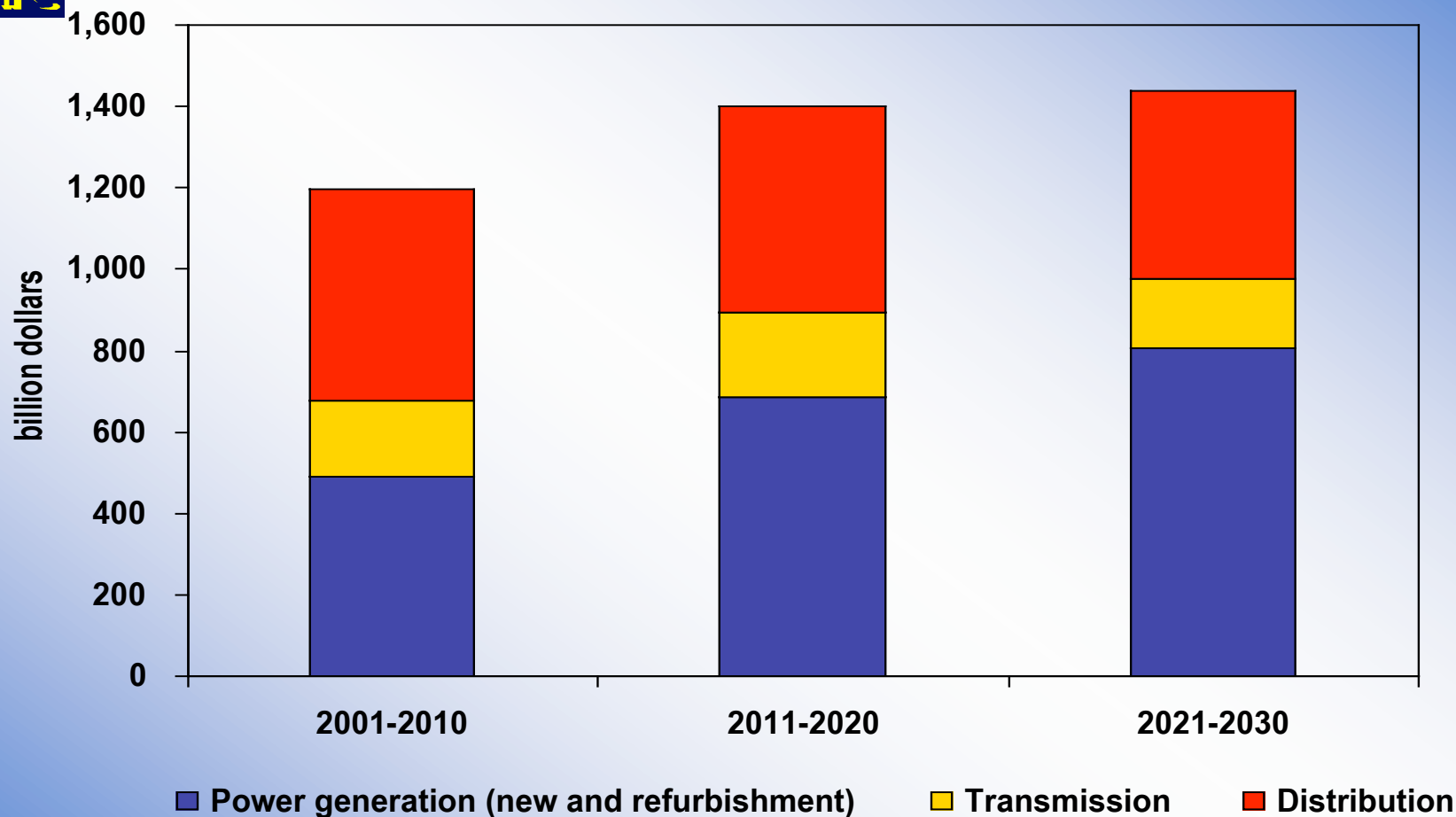


Most fossil-fuel power stations in North America and Europe are more than 20 years old

Source: IEA World Energy Investment Outlook 2003



OECD Power Sector Investment

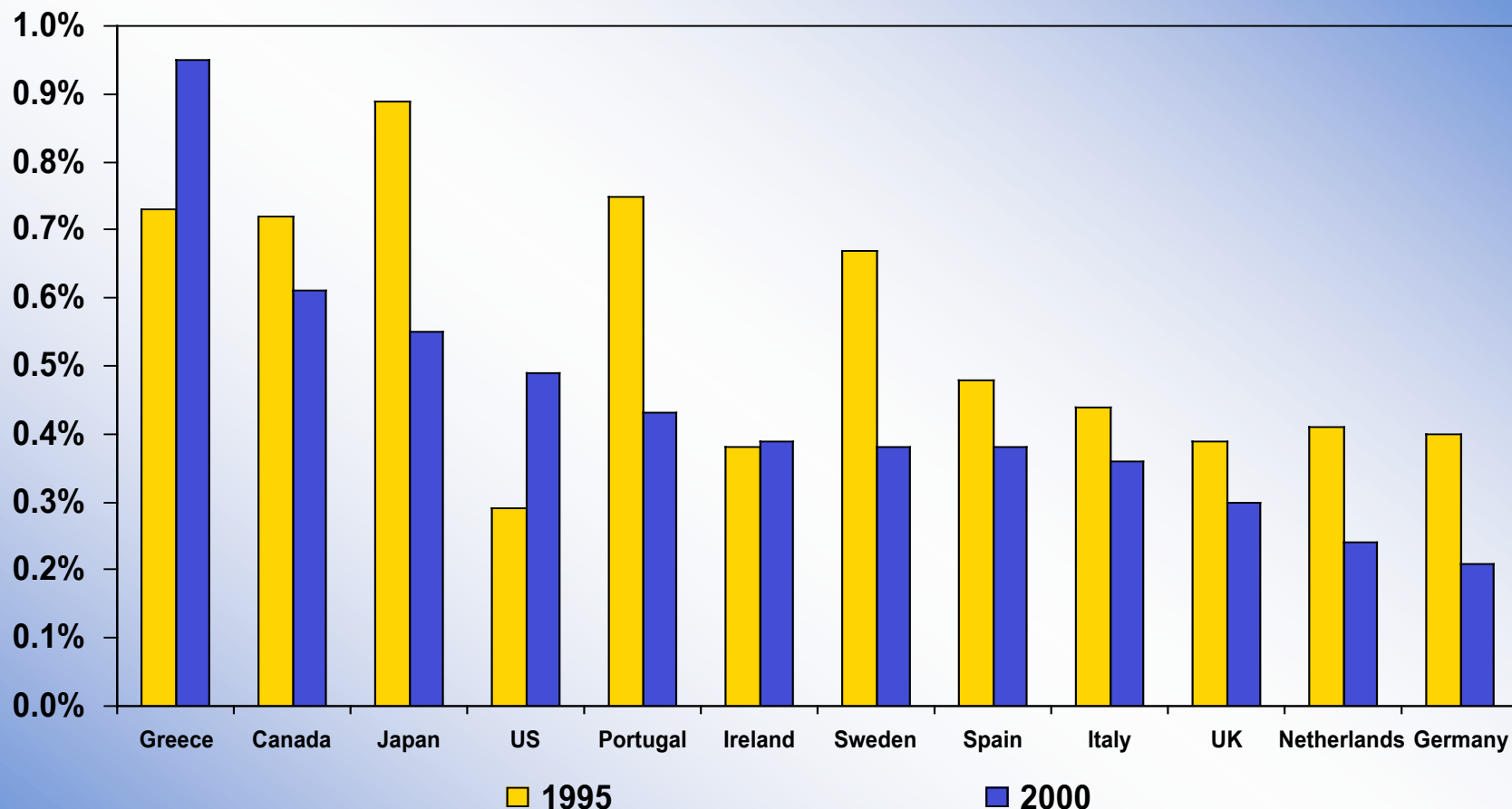


Power generation will absorb a growing share of OECD electricity-sector investment

Source: IEA World Energy Investment Outlook 2003



OECD Electricity Sector Investment Relative to GDP



***Electricity sector investment relative to GDP has risen in the US –
bucking the trend in most other OECD countries***

Source: IEA World Energy Investment Outlook 2003

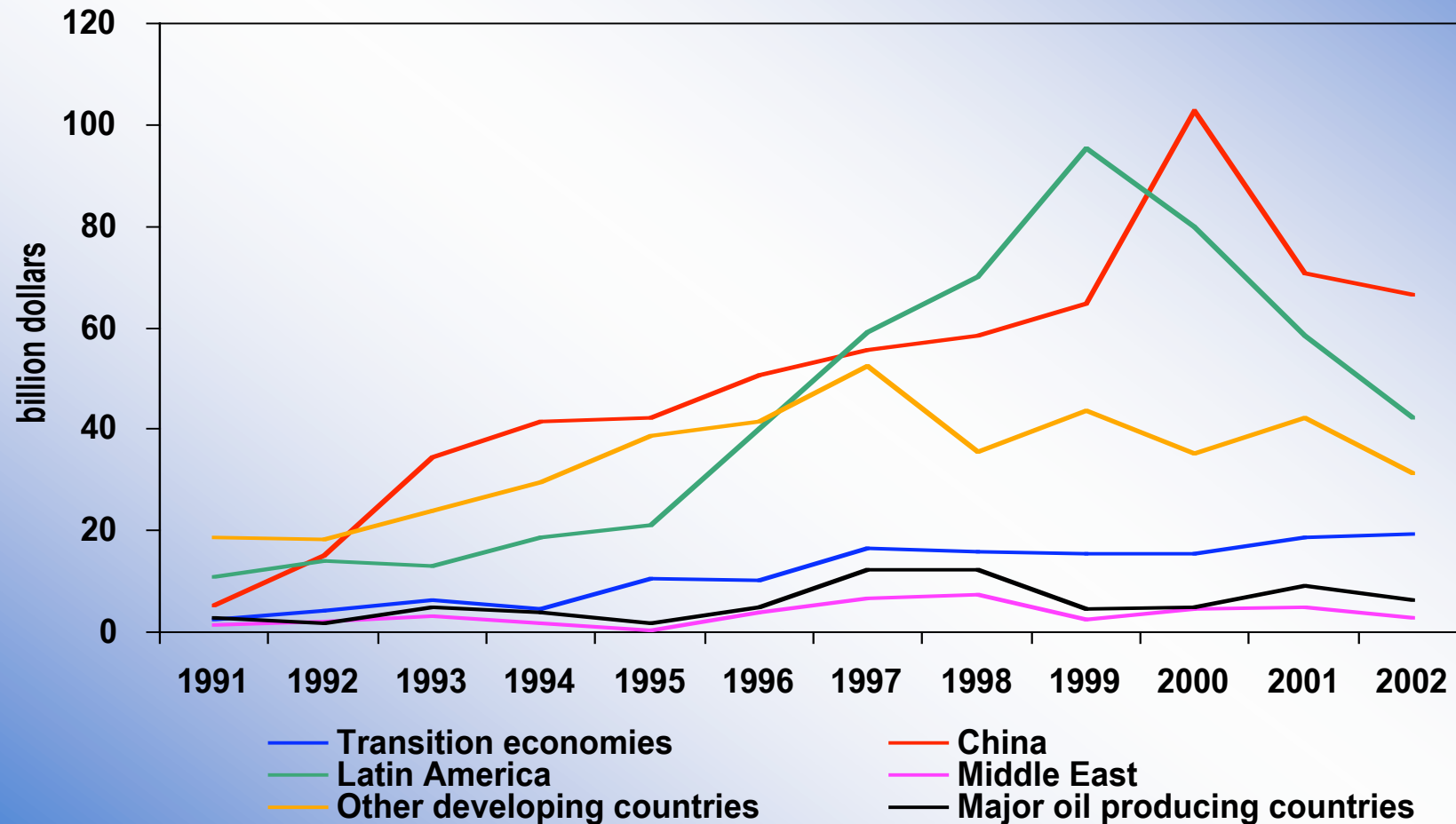


Power-Sector Investment Challenges in Developing Countries

- More than \$5 trillion needed (2001-2030) – far more than in past 3 decades
- Financing this will be challenging – especially in Africa and India
- Realising this investment will call for stronger incentives for private and foreign investors, notably
 - ◆ More rigorous sector reforms – notably more cost-reflective pricing and improved collection
 - ◆ More stable and predictable investment regimes
 - ◆ Better corporate governance
 - ◆ Development of domestic financial markets



Net Foreign Direct Investment Inflows to Developing Countries (all sectors)



Source: IEA World Energy Investment Outlook 2003/UNCTAD (2003)

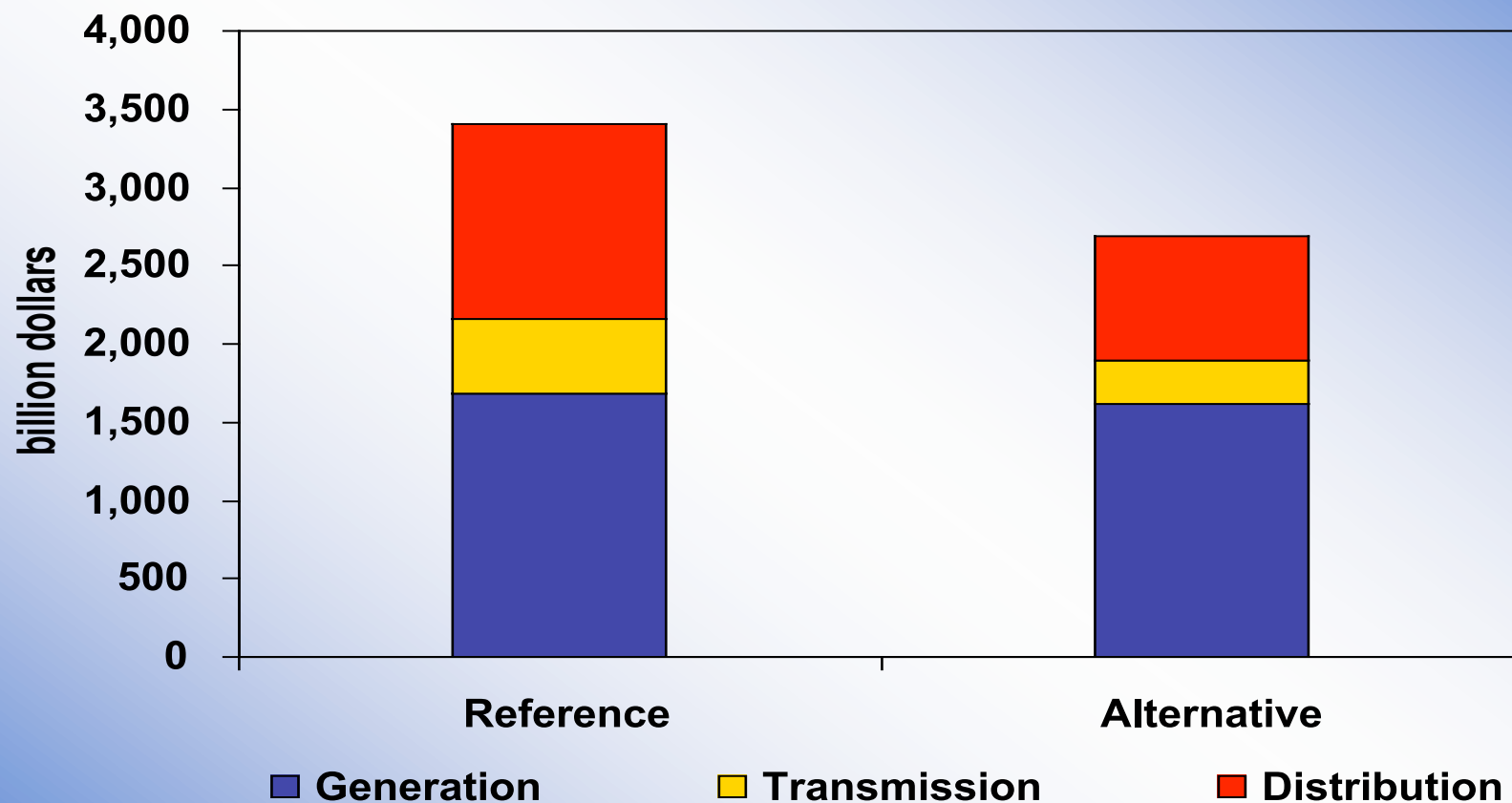


Alternative Policy Scenario in OECD Countries (With Tougher Environmental Policies)

- **Assumes adoption in OECD-area of contemplated measures to cut GHG emissions and save energy, e.g.**
 - ◆ Improved energy efficiency (gas, coal and fuel-cell plant)
 - ◆ 2% more electricity from combined heat and power (CHP)
 - ◆ An extra \$250 billion to support renewables
- **Outcome in 2030 (against Reference Scenario):**
 - ◆ 9% less primary energy use (11% lower electricity demand)
 - ◆ 16% lower emissions (switches from fossil fuels to renewables)
- **Major implications for entire supply chain investment**



OECD Investment in Alternative and Reference Scenarios

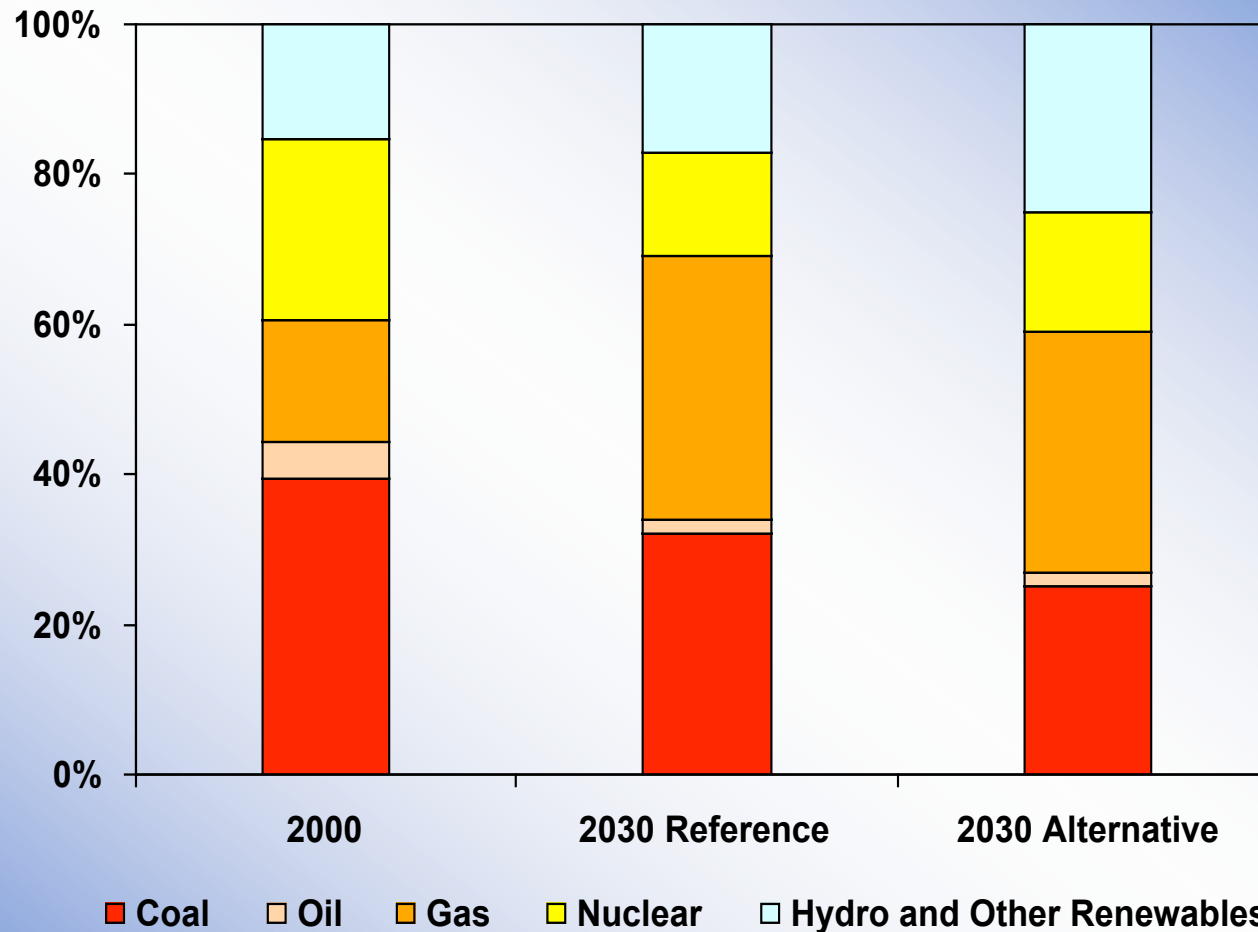


Transmission and distribution investments are much lower in Alternative Scenario, but generation investment hardly falls...

Source: IEA World Energy Investment Outlook 2003



OECD Electricity Generation in the Reference and Alternative Policy Scenarios



...because the share of non-hydro renewables, which are more capital-intensive, rises, offsetting the reduction in electricity demand

Source: IEA World Energy Investment Outlook 2003



Policy Implications

- Increasing emphasis on creating right enabling conditions – and lowering barriers to investment
- Less direct intervention as lender or owner
- OECD countries need to monitor and assess need to adjust regulatory reforms in network industries
- Non-OECD countries need to ensure basic principles of good governance are applied and respected – including cost-reflective pricing



Turning Challenges into Opportunities

- **Forward-looking technology choices promise:**
 - ◆ Greater efficiency
 - ◆ Zero Emissions Technologies for fossil fuels
 - ◆ Flexible solutions for fuel switching, where needed
- **Balanced investment promises:**
 - ◆ Long-term economic gains
 - ◆ Compliance with expected CO₂ regulations
 - ◆ Continued adequate diversification to ensure security of supply