The Role of Water-Cooled Reactors in the 21st Century

Economic & Financial Issues

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The Role of WCRs in 21st Century

- WCRs (mainly LWRs) will be the mainstay of nuclear capacity to 2050 and beyond
- Present designs build on 50 years of experience
- Evolutionary development has improved efficiency, reliability, lifetime and safety
- IEA scenarios envisage a role for up to 1,250 GWe of nuclear by 2050
- Important contributor to decarbonising electricity supply

Economics of New NPPs

- To be built in large numbers, new NPPs must be competitive with alternatives
- Many local factors can affect comparisons, but discount rate has largest impact
- On lifetime cost per kWh basis, NPP costs broadly similar to coal and gas in OECD Europe and North America regions
- Nuclear costs lower in OECD Pacific region
- This assumes long-term, stable CO_2 pricing (such as ETS or similar schemes)

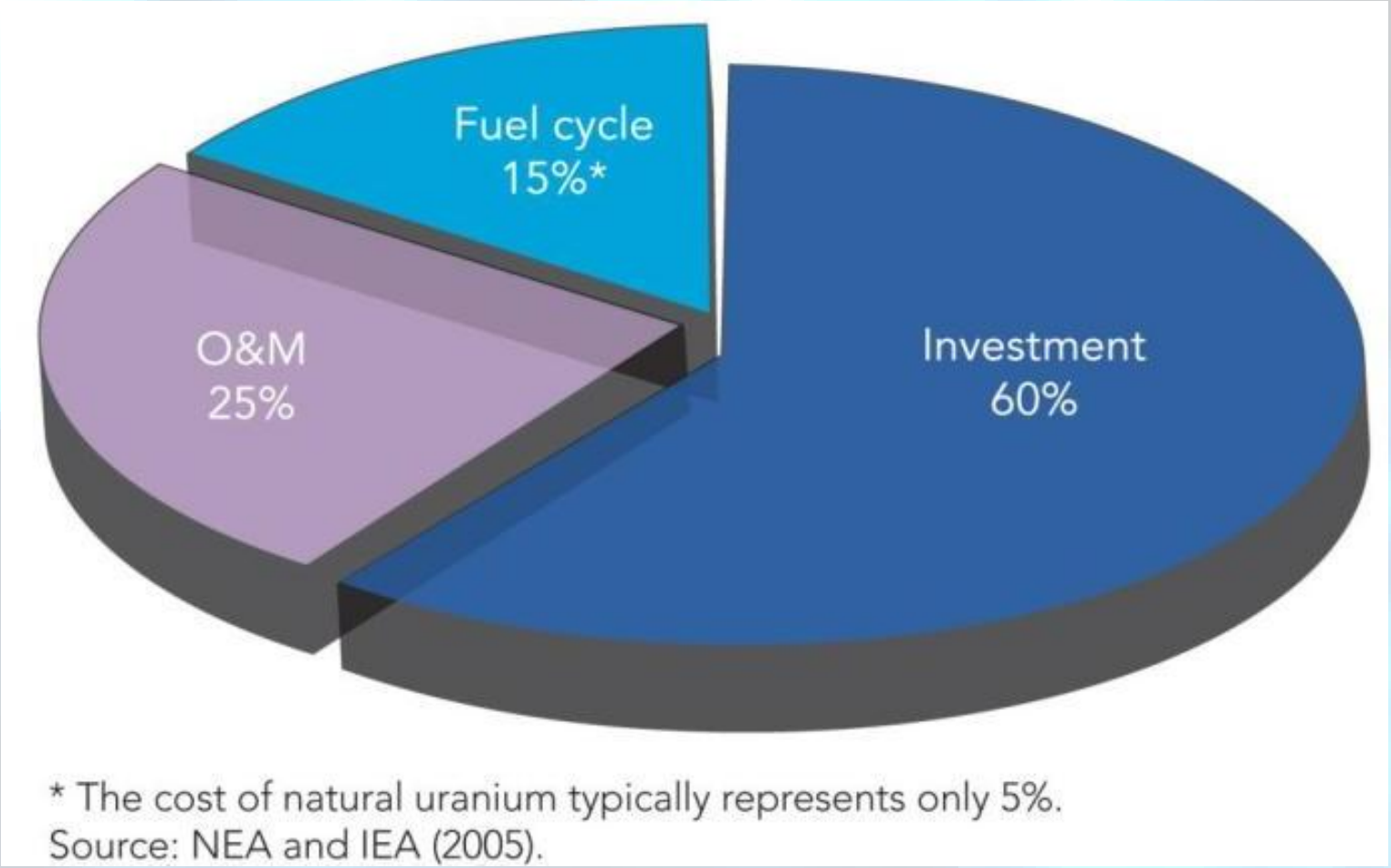
Improving the Economics

- Larger plants offer improved economics, but require larger investment
- Standardised designs should improve economics of a series of plants
- But, need to build FOAK plants
- Harmonisation of regulations, codes & standards would aid standardisation
- Key is shorter construction times, avoiding delays
- CO_2 pricing will improve economics

Issues in Financing Nuclear Projects

- High capital costs & technical complexity lead to high risks during construction
- Long repayment period, hence increased electricity market risks
- Often controversial, leading to political & regulatory risks
- Need for clear solutions to fund waste management & decommissioning
- NPPs need to operate at high capacity factors for best economic performance

Nuclear Power is Capital Intensive



Breakdown of costs per unit of electricity generated

Effect of Discount Rates

5%	Nuclear	Coal	Natural Gas
Investment costs	50%	35%	14%
O&M costs	30%	20%	9%
Fuel costs	20%	45%	77%

10%	Nuclear	Coal	Natural Gas
Investment costs	70%	50%	20%
O&M costs	20%	15%	7%
Fuel costs	10%	35%	73%

Typical values for plants in OECD countries. Exact breakdown varies between countries and individual plants. (Source: NEA/IEA, 2005.)

Dealing with Construction Risks

- Financial risks of delays during construction will remain rather high
- Some residual risks can be transferred to or shared with other parties
- But most risk remains with NPP owners
- Evolutionary designs, but some FOAK risks remain for early projects
- Non-recourse (project) financing very unlikely in foreseeable future

Key Government Actions

- Clear and sustained policy support, as part of long-term national energy strategy
- Work with utilities, investors & industry to facilitate nuclear projects
- Efficient & effective regulatory system
- Plan for waste & spent fuel management, with clear financial arrangements
- Electricity market structure & regulation to encourage long-term investments
- Clear long-term CO_2 pricing arrangements

Government Support for Financing

- Governments may need to address construction risks to encourage investment
- Financing likely to be more difficult in deregulated electricity markets
- Cost of capital is key, government guarantees in some form may be needed (e.g. loan guarantees, CO_2 floor price, etc.)
- Export Credit Agencies could also help
- In non-OECD countries, World Bank & other multilateral lenders could have role

Impact of Present Financial Crisis

- Does not alter fundamentals, NPP financing issues remain the same
- But both public & private sector finance will be tight, at least for next few years
- Will also reduce energy demand, and has led to lower oil & gas prices
- May lead to delays in decision-making
- Commodity & labour prices may moderate
- Governments may be more willing to invest in strategic industries

Economics & Financing: Summary

- Advanced standardised designs should be competitive with alternatives
- But this remains to be demonstrated
- Economics improved by CO_2 pricing
- Financing remains a challenge, especially during the construction phase
- Government role in setting policy, legal & regulatory frameworks is vital
- Targeted measures to reduce financing costs may also be needed