9. CONCLUSIONS

A 40 per cent reduction in levelised lifetime fuel cycle costs for a large PWR power station has occurred since the previous OECD/NEA study which was published in 1985. This reduction is due to improved fuel and reactor performance factors and reductions in the projected price of certain fuel cycle components. Improved fuel and reactor performance factors contributed a fifth of the reduction; the remaining four-fifths was due to major reductions in the price of uranium and enrichment services and reductions in the price for back-end fuel cycle services.

Based on the discounted cost methodology, using a 5 per cent per annum discount rate, the resulting lifetime fuel cycle costs are 6.23 mills/kWh and 5.46 mills/kWh for the reprocessing and direct disposal options, respectively. Figures 7.1 and 7.2 of Chapter 7 give a breakdown and comparison of these costs with those of the 1985 study. The effects that the price and performance factors have had on the costs is indicated.

The front-end component of the fuel cycle contributes about 80 per cent of the total levelised lifetime cost. The front-end cost is the same regardless of the spent fuel management option chosen.

The magnitude of the back-end component of the fuel cycle cost depends on the option chosen for the management of the spent fuel. In this study two examples were selected, one based on a hypothetical new reprocessing plant based on the THORP design, the other based on the Swedish SKB development programme. The ratio of the reprocessing component, less credits, to the direct disposal component approaches a factor of two in absolute terms. However, in overall fuel cycle cost terms the direct disposal option remains at about 10 per cent lower than the reprocessing option based on the reference case studied.

Whilst reprocessing services are currently on offer from BNFL and COGEMA on a world market basis, the development of the direct disposal option is country specific. Noting the latter, in coming to a view on the appropriate sensitivity range to be used, recognition was given to the 5 per cent levelised prices obtained from cost estimates provided by other countries that are pursuing the direct disposal option. The German and US options were chosen to provide an indication of higher and lower prices for sensitivity study purposes. This leads to ranges of -75 to +25 per cent and -80 to +10 per cent round the reference prices for the transport/storage and encapsulation/disposal components, respectively. It should be noted that other countries may have costs which lie outside this range.

An analysis has been performed to determine the uncertainty that should be attached to the fuel cycle cost estimates based on best estimate data. The analysis shows that for either option the costs are likely to lie within a 20 per cent range at the 95 per cent confidence level.

The use of a 5 per cent per annum reference discount rate is still considered appropriate in reflecting the consensus of national practices. It enables a comparison to be made with the results of the 1985 study and is consistent with the methodology used to calculate the overall generation costs for new power stations be they nuclear or fossil-fuel powered. These costs are appropriate for investment appraisal. However, the discount rate appropriate to individual countries may differ from the 5 per cent per annum used and results have been quoted in this report over a wide range of discount rates from 0 to 15 per cent per annum in recognition.

Once an investment decision has been taken, utilities will be interested in financial appraisal of fuel cycle costs. This will involve matters of financial policy such as provisioning in the accounts and the selection of appropriate rates of interest. An annex in this report identifies the differences that occur in lifetime levelised costs when financial appraisal is undertaken as opposed to investment appraisal.

The reference levelised fuel cycle costs were based on a PWR power station. Experience shows that comparable fuel cycle costs would apply to a similarly sized BWR power station, commissioning and operating over similar time-scales. The fuel cycles for power stations based on the ATR and CANDU reactor types were also considered but no fuel cycle cost comparison has been made between these reactor types and the reference PWR used in this study, because the cost data for these two types are country specific.

A contemporary OECD/NEA-IEA study[4] has been carried out on the projected costs of generating electricity from nuclear, coal and gas-fired power stations. That study shows that the proportion of the total generating cost taken up by the fuel component is, typically, 15 to 25 per cent, at 5 per cent real discount rate, for nuclear. Whereas in fossil-fuelled generation the fuel component is, typically, 40 to 60 per cent and in the case of gas it is, typically, 70 to 80 per cent of the total cost. Clearly, nuclear generation costs are far less sensitive to fuel price volatility compared with the fossil fuel alternatives.

In the light of the underlying cost uncertainties, the small cost difference between the prompt reprocessing and direct disposal options is considered to be insignificant and in any event represents a negligible difference in overall generating cost terms. It is likely that considerations of national energy strategy including reactor type, environmental impact, balance of payments and public acceptability will play a more important role in deciding a fuel cycle policy than the small economic difference identified.

10. REFERENCES

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