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URANIUM ADVISORY COUNCIL

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FEASIBILITY OF URANIUM ENRICHMENT IN AUSTRALIA

The Uranium Advisory Council has taken note of the various statements made by Commonwealth Ministers in the course of this year, particularly those by the Minister for Trade and Resources on 23 January and by the Prime Minister on 6 September, indicating that the Commonwealth Government is sponsoring a study of the feasibility of establishing a commercial uranium enrichment industry in Australia. The Council believes that, having regard to its terms of reference, it might appropriately offer the Government its preliminary views on the subject.

2. The Council has studied all currently relevant factors that are known to it and that need to be weighed in seeking a balance between the possible advantages and disadvantages of embarking on a uranium enrichment project. It has considered these factors under a series of headings and canvasses them in the following paragraphs.

Domestic Political and Public Attitudes

3. While Council members are well aware that there is substantial resistance in Australia, at both political and community levels, to the mining, milling and export of uranium itself, we believe that there is full support at all levels for the principle that Australian mineral ores generally should wherever practicable be processed here before export. Given that the export of uranium is destined to continue, the persistent image of Australia as a mere quarry could be ameliorated to the extent that its product goes abroad in enriched form.

Available Enrichment Technologies

4. The Council is not of course qualified to express a judgement on which of the enrichment processes so far developed should be chosen if there should be a decision to authorise the establishment of a commercial industry. Members have been given to understand by the Australian Atomic Energy Commission, in the course of a comprehensive briefing, that the gas centrifuge process, on which the Commission has been working, may offer certain advantages over the well developed gaseous diffusion technique. We are advised that the gas centrifuge process requires considerably less electric power and cooling water; that a centrifuge plant can be expanded progressively in separate modules from relatively modest size; and that the manufacture of much of its component machinery could provide opportunities for Australian manufacturers who are already well equipped for such a market.

Economic Considerations : Costs and Markets

5. The Council has seen various estimates of the cost benefits of uranium enrichment using either of the existing established techniques, showing profits on funds invested estimated in the range from 20% upwards. One analysis by an Australian mining industry group describes uranium enrichment as a "moderately profitable business". A recent report (INFCE/WG.2/15 - not yet public) from a Working Group of the International Nuclear Fuel Cycle Evaluation Conference (composed of representatives of over 60 countries) concludes that "the technical and economic viability of enrichment techniques is well established".

6. These and other comparable analyses are conditioned by uncertainty about future marketing prospects for enriched uranium. Authoritative Australian and other sources, including INFCE, agree that the enrichment market will probably be adequately supplied until about 1990 but predict that demand will grow thereafter, perhaps substantially. At the same time

it has been pointed out that the enrichment market may have a limited life expectancy if fast breeder technology should develop more rapidly than expected.

7. Other prime considerations must be the cost of establishing an enrichment plant (including buying the necessary additional technology from abroad) and the apportionment of investment, management and regulatory control between Government and private (including overseas) sources. Council members have been given a figure of the order of \$A500m as a minimum viable investment. Apart from the general desirability of continued firm control over the project by the Commonwealth Government, we would imagine that substantial Government participation in one form or another would be necessary in an investment of this magnitude, if only to limit the need to look abroad for capital. As a possible model for an operational and financial partnership between Government and the mining industry the Council would suggest a study of the joint corporations that have been established to manage nuclear power production in the United Kingdom and elsewhere in Europe.

8. However, when it comes to estimating the commercial viability of a uranium enrichment plant in Australia, taking account of establishment costs and market uncertainties over a lead time of some years, the Council feels that it lacks the necessary economic and technical expertise to enable it to make such an assessment.

Industrial, Employment and Community Impact

9. It has been noted in para 4 above that some Australian industries could profit by their ability to manufacture centrifuges and other component machinery for an enrichment plant. It appears that the enrichment process can not itself be expected to create large employment opportunities. But the AAEC has pointed out that the construction stage could require

the employment at the site, for an extended period, of large numbers of construction and engineering workers who together with their dependents may have a significant impact on community services and the economics of the area. Any socio-economic benefits to the local community could be offset to some extent by the strain imposed on local service facilities such as schools, hospitals, water supply, sewerage, etc, and by some economic downturn subsequent to the completion of construction, all of which would indicate the need for planning in advance and applies with the same force to any large-scale industrial enterprise.

Environmental Effects

10. The AAEC has provided the Council with a comprehensive briefing on the likely environmental impact of an enrichment plant both during the construction period and during operation of the plant. The Council is aware that the AAEC could be thought to have a vested interest in enrichment; nevertheless such enquiries as we have been able to make of other sources do not lead us to doubt the reliability of the Commission's findings.

11. The Council notes that in the construction phase adequate care will need to be taken to minimise and where necessary remedy any adverse effects from use of the land on and adjoining the site of the plant, including disturbance of the existing ecosystems, rainwater erosion and water drainage, accidents and air pollution from increased vehicular traffic and accumulation of construction wastes.

12. At the operational stage the worst possible accident that might be postulated in either a gaseous diffusion or a gas centrifuge plant would be a pipe rupture or other breach of containment which might allow some of the UF_6 to escape to the atmosphere and the effects of which would be minimised by

isolation of process stages. The radiological consequences of such accidents would result in exposure of an individual off-site less than that which would result from a year's exposure at the (U.S.) guideline limits for occupational concentration.

13. With respect to possible effects of thermal discharges on the adjacent land, water, terrestrial fauna and aquatic ecology, the Council accepts that any damage could be confined to the immediate vicinity of the plant or avoided by adequate design of the heat dispersion system.

14. With regard to radioactive effluent from air or waste water discharges, the possible effects of exposure would depend on the natural and social conditions of the plant site and its environs, and measurements would need to be made for a specific site. The United States Energy Research and Development Administration (ERDA) has estimated that radioactivity discharged during normal plant operation would represent an increase in exposure of less than 0.1 per cent of that received by an individual from natural background radiation. ERDA also concluded that with normal plant operation no radiation injury would be detected on aquatic biota or land mammals as a result of the release of radioactive nuclides. Assessments of radioactive effluent under conceivable accident conditions, such as building fires, damage to the gas flow system, UF_6 discharge from cylinders, accidents during UF_6 transport etc, would have to be carried out, but it should be possible to restrict any such discharges to within the allowable limit by adequate design of facilities and vessels.

15. The effects of other chemical discharges in the form of gaseous effluents would not be detectable beyond the buffer zone provided around the plant. Liquid chemical effluents would need to be assessed in respect of specific site conditions.

16. Given that a uranium enrichment plant should be designed, built and operated in full cognizance of current standards and knowledge of safety, industrial hygiene and environmental protection, and with particular attention to conceivable accidents and hazards and the security of the general public, the Council accepts that the normal routine operation of the plant would be such as to have little or no effect on the environment.

Proliferation Aspects of Enrichment

17. The report of the INFCE Working Group (INFCE/WG.2/15) referred to in para 6 points out that proliferation risk is inherent in enrichment technologies.

18. The report notes that most enrichment facilities based on proven technologies (i.e. diffusion and gas centrifuge) are designed and constructed to produce low enriched uranium for nuclear power programmes which cannot be used as such for nuclear weapons. The main proliferation risk lies in its possible diversion from power production for use in an enrichment facility suitably modified to produce high enriched, weapons grade uranium. Such modifications, according to the report, would entail varying degrees of difficulties and operational changes which would be vulnerable to detection, particularly if the plant in question was under safeguards from its inception.

19. The report goes on to suggest that proliferation in uranium enrichment can be minimised by the application of effective international safeguards to facilities producing low enriched uranium and by multinational or national institutional arrangements for controlling plant technology and nuclear material produced; and that accurate material accounting and effective surveillance measures should enable detection of the misuse of a safeguarded plant as well as the diversion of nuclear material. (This would seem to point up the functions and status of the Australian Safeguards Office and a possible need for upgrading if Australia is to embark on an enrichment programme.)

Siting of Plant

20. The Council understands that whereas the requirement for very large supplies of electricity and cooling water would limit the number of suitable sites in Australia for a gaseous diffusion plant, many more sites, even in remote areas, could be suitable for centrifuge enrichment. It has been noted that the Governments of Western Australia, Queensland, South Australia and the Northern Territory have each advanced arguments in public in favour of the siting of an enrichment plant within their own boundaries.

Other Possible Factors

21. A number of other points have been mentioned as additional justification, however marginal, for uranium enrichment processing in Australia. It has been suggested that Australian science and technology, as well as Australian industry, could benefit from the introduction of a new productivity technique which might also bring about a gradual increase in public sophistication and understanding about nuclear energy. Again, we are reminded that uranium exported in enriched form and subject to full international safeguards would be immune from foreign legal actions such as the one brought by the Westinghouse Corporation in the U.S.A. Finally there is some belief, which could turn out to be well-founded, that for Australia to become involved in uranium processing would increase its standing and authority internationally among the principal producers and users of nuclear power.

Conclusions

22. From all the foregoing considerations the Council has identified four in particular which in its opinion need to be weighed in estimating the feasibility of enrichment processing in Australia. In respect of all four the Council has reached a broad consensus with the exception of Mr Kelty, who indicated that the policy of the Australian Council of Trade Unions is opposed to the mining, enrichment and export of uranium until safeguards it considers adequate can be fully developed.

23. The first consideration rests on whether or not Australia possesses the basic expertise to plan, build and operate an enrichment plant efficiently, on the assumption that the required additional technology and equipment can be obtained from abroad. The Council accepts that the AAEC possesses the necessary technical skills and experience, as a result of the research that it has already conducted into the centrifuge process, to advise on and if necessary participate in the planning, construction and operation of a plant, and that the Australian industrial structure provides an existing basis for the manufacture of some of the necessary component machinery for a centrifuge plant.

24. The second consideration relates to the economics of enrichment processing - the balance between construction and operating costs and marketing prospects. The Council does not regard itself as competent to offer a valid judgement as to the economic viability of an enrichment project.

25. As to the third consideration - the environmental effects of uranium enrichment processing, particularly important from the viewpoint of the general public - the Council has been guided by the comprehensive briefing given to it by the AAEC on the possible hazards of accidents and radiological, chemical and other waste discharges at the constructional and operational stages of an enrichment plant. The Council notes that while certain of these effects would need to be assessed in respect of specific conditions at a particular site, the normal routine operation of the plant would be such as to have little or no effect on the environment. The Council would nevertheless expect that an environmental impact study would be prepared by the managing authority when a specific site has been chosen.

26. The risk of nuclear proliferation "inherent in enrichment technologies" (para 17 above) also has to be considered. The Council must assume that the Commonwealth Government would not authorise the establishment of a commercial enrichment plant without ensuring that it was subject to the effective international safeguards, institutional controls and surveillance measures that the INFCE Working Group believes can minimise the risk of diversion of low enriched uranium for production of weapons grade material.

27. The Council's overall judgement is that, assuming that the balance between costs and markets is considered by the Commonwealth Government and private industry to be acceptable, it can see no valid reason against the Government's proceeding with a study of the feasibility of, and perhaps participating in the establishment of, a commercial uranium enrichment industry in Australia.

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