CHAPTER 3

EXISTING QUANTITIES AND FUTURE CREATION OF RADIOACTIVE WASTE

3.1 In Australia radioactive waste generated through medical, industrial and research uses of radioactive sources is a relatively small amount compared with that produced in mining and milling operations. Australia does not have a nuclear power industry or nuclear weapons, which generate substantial amounts of waste in some other countries.

3.2 Australia's only nuclear reactor, HIFAR, produces radioactive neutrons for investigative purposes in science, medicine and industry. HIFAR currently produces about 85 per cent of the radioisotopes and radiopharmaceuticals used in Australia.[1] Radioisotopes can also be produced in cyclotrons and there are currently two operating in Australia. Radioisotopes are used to diagnose and treat illnesses such as cancer, and to sterilise medical products and instruments.

3.3 Isotopes are also used in industry to check structures for cracks, to gauge the thickness of materials, for checking oil and gas pipelines, for insect and pollutant control and for smoke detectors. The long term management of the radioactive waste from these types of activities needs to be addressed.

Sources of Radioactive Waste

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3.4 The production of radiochemicals and radiopharmaceuticals accounts by volume for more than 90 per cent of all liquid radioactive waste and more than 70 per cent of all solid radioactive waste produced at the ANSTO site.[2]

3.5 Currently there are 4200 drums of low level solid waste in storage at ANSTO's Lucas Heights property.[3] The total accumulated volume of liquid intermediate waste is six cubic metres with an annual accumulation rate of 300 litres.[4] There are also 200 cubic metres of intermediate level solid waste

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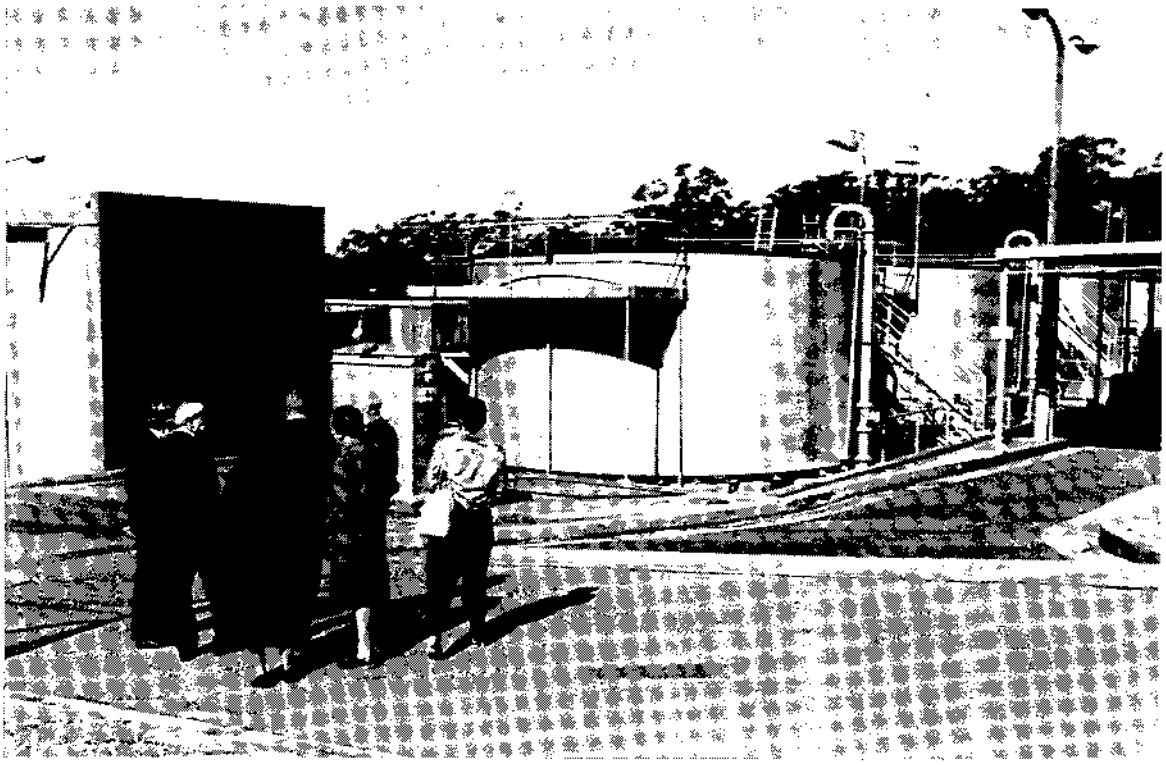
1 Australian Nuclear Science & Technology Organisation, Supplementary Submission No. 32b, p. 3

2 Jostsons, Transcript of Evidence, p. 57

3 Australian Nuclear Science & Technology Organisation, Submission No. 32, p.3-4

4 Ibid, p. 5

increasing by about seven cubic metres per year, and in May 1991 there were 1661 spent fuel elements in storage, increasing by about 36 rods per year.[5]



The Committee inspecting the low level liquid waste treatment plant at Lucas heights (Photograph provided by ANSTO)

3.6 The Committee was told that:

> Ironically, the biggest Governmental producer of radioactive waste in Australia - ANSTO - has recently switched its HIFAR reactor to a Technecium-99m (T-99m) production method that has actually increased the amount of radioactive waste created. This was done because the "dirtier" method was cheaper, as ANSTO conceded to Greenpeace in 1993.[6]

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5 Australian Nuclear Science & Technology Organisation, Submission No. 32, p. 5,7

6 Greenpeace, Submission No. 48, p. 3

3.7 Greenpeace considers the research reactor spent fuel rods to be high level radioactive waste although ANSTO disputes this.[7] ANSTO argues that research reactor spent fuel rods are not 'waste' because they can be reprocessed. ANSTO points out that they differ from fuel rods used in power reactors and are not high level radioactive material.[8] The Committee considers this debate to be academic in relation to this Inquiry and that correct management of these fuel rods is the issue. ANSTO points out that:

> The presence of aluminium influences the eventual conditioning of the spent fuel and the high level of uranium enrichment in research reactor fuel poses particular safeguards and criticality problems for the disposal of such fuel.[9]

Other Commonwealth Bodies

3.8 CSIRO produces radioactive waste through biological experiments and other experiments such as the beneficiation of ore experiments and sealed sources from analysis and measurements.[10] The CSIRO waste from Fishermens Bend at Woomera is slightly contaminated soil which is stored in 9726 drums of 207 litre capacity.[11]

3.9 The annual amounts of radioactive waste generated by the Department of Defence are minor amounts of radioactive waste, mostly comprise equipment containing radioluminescent material or tritium gas and waste from the research activities of the Defence Science and Technology Organisation.[12] Sources from Amersham International in the United Kingdom can be returned to the company.[13]

3.10 The Australian Defence Industries material from St Marys now stored at Woomera, is approximately half low level material and about half intermediate level waste.[14] This material originated from sources within the Commonwealth and State and Territory governments, universities, hospitals and from medical

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7 Pearson, Transcript of Evidence, p. 453; Australian Nuclear Science & Technology Organisation, Submission No. 32, p. 6

8 Australian Nuclear Science & Technology Organisation, Submission No. 32, p. 6

9 Ibid, p. 6

10 CSIRO, Submission No. 25, p. 3

11 Blewitt, Transcript of Evidence, p. 85; Blewitt, Correspondence, 26 July 1995, p. 1

12 Department of Defence, Submission No. 33, p. 1

13 Ibid, p. 1

14 Curtis, Transcript of Evidence, p. 116

practitioners. The Department of Defence accepted responsibility because of the wide range of sources.[15] About half of this waste, in terms of radioactivity, is cobalt^{60}.

Medical Sources

3.11 The four types of radioactive waste generated in significant quantities in medicine are unused radiopharmaceuticals; used sealed sources; contaminated equipment or other materials such as syringes and bed-linen; and bodily excretions of patients following diagnostic or therapeutic procedures.[16] The first three categories produce approximately 30 per cent of the waste while the fourth category produces the remaining 70 per cent.[17]

3.12 Radioactive isotopes used for diagnostic purposes usually have short half lives and the quantities are small. The short lived waste is disposed of in the normal waste stream after storing for a short period to allow it to decay. It was suggested that all isotopes should be stored without any disposal to sewer, but this has not occurred.[18] Patients' excrement is dealt with as short lived waste.

3.13 Sources with higher activity used for therapeutic purposes are generally not suitable for immediate disposal.[19] These sources are surplus to hospital needs but require longer term storage. For example, St Vincent's Hospital Sydney Ltd has a number of caesium^{137} tube sources from an obsolete technique.[20]

3.14 Teaching hospitals, in particular, generate radioactive waste which is difficult to deal with because it is in toxic or flammable liquids.[21] The Committee was told that many hospitals have conducted waste audits in order to reduce the volumes of radioactive waste being generated and to look at issues such as the management of radioactive putrescent materials.

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15 Curtis, Transcript of Evidence, p. 119

16 Australian & New Zealand Society of Nuclear Medicine, Submission No. 68, p. 1

17 Ibid, p. 1

18 Hanlon, Transcript of Evidence, p. 421

19 Australian Radiation Laboratory, Submission No. 21, p. 1

20 St Vincent's Hospital Sydney Ltd, Submission No. 59, p. 2

21 Collins, Transcript of Evidence, pp. 751-752

Industrial Sources

3.15 A number of companies are currently storing radioactive materials pending a decision on a national repository site. Penrice Soda Products Pty Ltd store obsolete sealed radioactive sources on site as the cost of disposal overseas is considered prohibitive.[22] Coca Cola Amatil has a radiation gauge which was taken out of service in 1986.[23] BHP have eighty radioactive sources, mainly cobalt^{60} or caesium^{137}, and would be interested in disposing of twelve in a national repository.[24] Other industrial sources include compasses used by geologists which contain tritium,[25] and radioactive sources used to detect water levels in bore holes.[26] Roads authorities also use radioactive sources routinely for the quality control in manufacturing road beds.[27]

3.16 About 400 000 tonnes per year of radioactive waste is produced from six mineral processing operations in Western Australia, and this material is stock piled on site awaiting further treatment at a processing plant.[28] The cost of transporting mineral sand tailings to a national repository is generally considered by the industry to be prohibitive unless it is in close proximity to the mine site.[29] Some members of the Committee believe that proper waste disposal should be included as part of the cost of production and if this makes the proposal economically unviable then it should not proceed.

Future Generation of Radioactive Waste

3.17 In 1986 there were estimated to be a national total of 960 cubic metres of radioactive waste in Australia requiring storage or disposal, with an annual increase of 50 cubic metres.[30] Since then some States have significantly reduced the volume of the waste held. However there are a number of special cases where particularly large volumes of waste might be produced in the foreseeable future. These include the decommissioning of ANSTO's HIFAR

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22 Penrice Soda Products Pty Ltd, Submission No. 55, pp. 1-2

23 Coca Cola Amatil (SA) Ltd, Submission No. 56, p.1

24 BHP Steel, Submission No. 58, p. 1

25 Peebles, Transcript of Evidence, p. 836

26 Paix, Transcript of Evidence, p. 226

27 Ibid, p. 226

28 Hewson, Transcript of Evidence, p. 235-236

29 Rawson, Transcript of Evidence, p. 42

30 Department of Primary Industries and Energy, Submission No. 28, p. 4

reactor and future reactors, an increase in the amount of waste produced by replacing the existing research reactor with one of greater capacity, residue from reprocessing spent fuel rods, the proposed Rhone Poulenc rare earth project in Western Australia and other similar proposals, and the large numbers of smoke detectors entering the market.

3.18 The Fishermens Bend contaminated soil currently in storage at Woomera and Maralinga former atomic bomb test site still need to be dealt with. CSIRO is currently considering the possible clean up a number of sites where some radioactive material may have been buried. These sites include O'Hallorans Hill in Adelaide and sites in Queensland at Longpocket and Sandford.[31] The Department of Defence has retrieved some radioactive materials previously buried at Salisbury in South Australia.[32] These materials, once recovered, may be considered as additional quantities of radioactive waste to be managed.

3.19 The Committee believes that these large quantities must be considered in developing a national strategy to deal with radioactive wastes.

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3.20 Future waste generated from ANSTO can be separated into five major categories: waste produced during operation of the reactor and production of radiopharmaceuticals; residue from the reprocessing of the fuel rods and any fuel rods not returned to the country of origin; waste from decommissioning the existing and future reactors; emissions to air and sewer; and possible remediation of the Little Forest Burial Ground.

3.21 About 90 per cent of Australia's annual generation of radioactive waste other than that from mining and milling are created at Lucas Heights.[33] Compacted low level waste increases about 30-40 cubic metres, intermediate level solid waste about two cubic metres and intermediate level liquid waste about 0.3 cubic metres per year.[34]

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31 Smiles, Transcript of Evidence, p. 91; Harley, Transcript of Evidence, p. 91

32 Department of Defence, Supplementary Submission No. 33a, p. 1

33 Davoren, Transcript of Evidence, p. 35

34 Rolland, Transcript of Evidence, p. 74

1. Waste from the Research Reactor Operations

3.22 The amount of radioactive waste produced at ANSTO is directly proportional to the demand for medical isotopes.[35] Greenpeace is concerned that a new research reactor could allow an increase in production of radiopharmaceuticals resulting in a three to four fold increase in waste created at that site.[36]

2. Reprocessing of Spent Fuel Rods

3.23 ANSTO intends to return the spent fuel rods from the HIFAR reactor to the United Kingdom and the United States. The residue from reprocessing spent fuel rods in the United Kingdom will be returned to Australia for storage: an estimated 340 cubic metres (670 concrete filled 500 litre drums) of intermediate level waste.[37]

3.24 The return of the spent fuel rods to the United States will not require that Australia take back the waste from reprocessing. Some consider that this waste is Australia's responsibility and Greenpeace has opposed this option and the Research Reactor Review stated that:

> exporting an Australian problem is morally dubious.[38]

3. Decommissioning of Reactors

3.25 The 1993 Research Reactor Review recommended that a decision on a new neutron source should be made in five years but the issue of waste management should be settled before then.[39] It is estimated that the decommissioning of the existing HIFAR reactor will generate five cubic metres of intermediate level waste and 500 cubic metres of low level waste initially.[40] After the 20 years cooling off period there would be a further few hundred tonnes of radioactive structural materials which would be mostly low level

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35 Bull, Transcript of Evidence, p. 72

36 Greenpeace, Submission No. 48, p. 5

37 Nuclear Safety Bureau, Submission No. 31, p. 2

38 Research Reactor Review *Future Reaction, Report of the Research Reactor Review*, August 1993, pp. 209, 212

39 Ibid, p. 216

40 Nuclear Safety Bureau, Submission No. 31, p. 2

waste.[41] The issue of dealing with the decommissioning of future reactors should also be considered prior to the approval of a replacement reactor.

3.26 The shutdown of the Moata reactor prior to decommissioning has left 177 irradiated fuel plates in storage.[42] The decommissioning phase will also generate waste which will need to be managed.

4. Emissions to Air and Sewers

3.27 ANSTO currently produces considerable amounts of iodine[131] and tritium, which concerns the Sutherland community.[43] ANSTO told the Committee that it would be looking at replacement reactors which would reduce environmental emissions significantly.[44]

5. Remediation of the Little Forest Burial Ground

3.28 Approximately 1700 cubic metres of low level waste, and possibly some intermediate and high level waste, was buried at the Little Forest Burial Ground between 1960 and 1968.[45] To date there has been:

> no detectable immediate health risk, however the site is contaminated and toxic, and a more detailed investigation has been recommended on the extent of movement of radioactive contaminants from the trenches and potential exposure pathways for near by residents.[46]

3.29 The Sutherland Shire Environment Centre told the Committee that plutonium had migrated to the surface in the Little Forest Burial Ground.[47] The Federal and State governments have decided to monitor the site and deal with any contaminants seeping from the site, although there are currently no long term plans to remediate the site.[48]

3.30 The Commonwealth Government is cleaning up other contaminated sites. These include Maralinga, Salisbury and O'Hallorans Hill in South Australia,

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41 Ibid, p. 2

42 Nuclear Safety Bureau, Submission No. 31, p. 2

43 Pearson, Transcript of Evidence, p. 453; Sutherland Shire Council, Submission No. 20, p. 8

44 Bull, Transcript of Evidence, p. 71

45 Sutherland Shire Council, Submission No. 20, p. 12-13

46 Ibid, p. 13

47 Ward, Transcript of Evidence, p. 594

48 Sutherland Shire Council, Submission No. 20, p. 13

Fishermens Bend in Victoria and Long Pocket and Sandford in Queensland. In the future the Commonwealth Government, may also have to remediate the Little Forest Burial Ground site. Any strategy plan for the management of radioactive waste in Australia must be able to accommodate this material if necessary.

Rhone Poulenc Rare Earth Project

3.31 The Rhone Poulenc rare earth processing project proposal in Western Australia will create 6 000 tonnes per year of radioactive waste containing up to 12 per cent thorium.[49] The thorium isotopes include thorium^{232} and thorium^{228} which have half lives of about 10 billion years and 1.9 years respectively.[50] The volume of radioactive material, indicates that the integrated health effects from exposure over time could be significant if the material is not managed appropriately.

3.32 The Rhone Poulenc proposal has been given an environmental assessment level of Environmental Review and Management Program, which is the highest level required in Western Australia under the *Environmental Protection Act 1994* (as amended).[51] As a foreign company Rhone Poulenc also requires approval by the Commonwealth Government's Foreign Investment Review Board. The potential for significant environmental effects resulted in a designation under the Commonwealth *Environment Protection (Impact of Proposals) Act 1974.*[52] The Commonwealth Environment Protection Agency is assessing the proposal in cooperation with the Western Australian Government.[53]

Smoke Detectors

3.33 As smoke detectors become routinely installed in domestic premises the question of their disposal becomes more pressing because of the sheer numbers involved. Smoke detectors contain americium^{241}; the limit of radioactivity is

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49 Hewson, Transcript of Evidence, p. 237

50 Ibid, p. 259

51 Schuster, Transcript of Evidence, p. 253

52 Commonwealth Environment Protection Agency, Supplementary Submission No. 46a, p. 2

53 Ibid, p. 2

now one microcurie[54], but in the past smoke detectors have contained much higher levels. Americium has a half life in excess of 400 years.[55]

3.34 The electronic component of smoke detectors lasts approximately ten years after which the smoke detector becomes unusable. The Committee was told that:

> Nowhere in the instructions of fire detectors or on the fire departments literature does it advise people about the safe disposal of smoke detectors and the difficulties associated with the incorrect disposal.[56]

3.35 The NSW Environment Protection Authority (EPA) is concerned at the large number of detectors entering the household rubbish system:

> the sheer numbers of these detectors presently entering the system is of concern and the public are becoming increasingly concerned about hazardous wastes entering the garbage stream.[57]

3.36 Last year approximately one million ionising smoke detectors were imported into New South Wales.[58] As the mandatory inclusion of smoke detectors in domestic premises becomes standard throughout Australia the number of ionising smoke detectors discarded annually in municipal rubbish tips will increase further.

3.37 The Radiation Health Committee of the NHMRC is looking at the potential problem resulting from the large volumes of smoke detectors which may occur.[59] The NSW EPA has proposed that a system be established for the recovery of domestic smoke detectors to return this material to the manufacturer.[60]

Other Future Waste Generation

3.38 The factors affecting future waste generation include changes in technologies, the commencement of new projects such as the Rhone Poulenc

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54 Hutchinson, Transcript of Evidence, p. 385

55 Samuel, Transcript of Evidence, p. 390

56 Queensland Greens, Submission No. 15, p. 3

57 NSW Environment Protection Authority, Submission No. 45, p. 3

58 Samuel, Transcript of Evidence, p. 390

59 Wallace, Transcript of Evidence, p. 724

60 Samuel, Transcript of Evidence, p 406

rare earth project, changes in future uranium contracts and the availability of disposal options. It was suggested that it would be impossible to predict future technological changes. For example, there would be more than 1000 soil moisture density gauges in Australia now whereas there were very few 15 years ago.[61]

3.39 It was pointed out that future uranium contracts may require the return of the waste products to Australia, and ways of dealing with this waste must be considered now in the design and capacity of a national facility.[62] It was argued that Australia should not provide uranium to the rest of the world without taking responsibility for the waste disposal.[63]

3.40 The Committee is concerned that the current international trend requiring the producer to take back the waste may require that Australia take back uranium waste if it wishes to continue uranium exports in the future. It is therefore essential that this be taken into account in the consideration of a national repository or storage facility.

Radioactive Waste Held in States and Territories

3.41 All States and Territories have some radioactive waste which they would prefer to send to a national facility. However the Northern Territory, Queensland, Victoria and Western Australia have now built new facilities which are capable of storing the waste for the immediate future.

3.42 The Queensland Government has established a purpose built facility at Esk which currently holds 219 devices containing radioactive sources. However, there are over 2000 radioactive sources in use in Queensland.[64]

3.43 The Victorian Government has recently built a new temporary storage facility, and has reduced the amount of material held by returning 80 curies of tritium exit signs to the United States and the United Kingdom and 4 curies of beta/gamma emitters to the original suppliers.[65]

3.44 The Western Australian Health Department has temporary storage facilities in Perth and in November 1992 dedicated a site at Mt Walton East for

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61 Wallace, Transcript of Evidence, p. 723

62 Dickinson, Transcript of Evidence, p. 200

63 Dickinson, Submission No. 1, p. 1; Women Opposing Uranium Mining, Submission No. 39, p. 6

64 Queensland Government, Submission No. 30, p. 1

65 Victorian Government, Submission No. 37, p. 3

shallow burial of suitable material. This site can also accommodate large quantities of waste from mineral processing.

3.45 In New South Wales there are approximately 100 cubic metres of radioactive waste stored in two repositories at Lidcombe, but this can be consolidated to approximately 30 cubic metres.[66] New South Wales accumulates approximately three cubic metres of unconsolidated waste and approximately one cubic metre of consolidated waste per year, some of which has an extremely long half life.[67]

3.46 From early 1978, the New South Wales Government attempted to move about 3000 tonnes of radioactive soil containing thorium and radium residues from Hunters Hill in Sydney to decontaminate six house blocks. Efforts to relocate the waste to a remote rural site at Manara (NSW) and South Australia were unsuccessful and this matter has not been resolved.

A National Inventory of Radioactive Waste

3.47 An inventory of radioactive waste was prepared by the Commonwealth-State Consultative Committee on radioactive waste which reported in February 1986. The Committee was told that although there has been some accumulation of waste since that time, the inventory is still a 'pretty accurate record'.[68] On the other hand, evidence presented to the Committee indicates that there have been significant changes to the national inventory since it was produced in 1986.

3.48 The Committee is concerned at the accuracy of the current inventory. One university has stored radioactive materials which it has not identified and others may have similar problems.[69] Other waste is improperly labelled and some containers were described as rusty and in poor condition, and resources would need to be committed to identify the waste before disposal.[70] There is a difficulty in defining waste in terms of volume: for example, the two cubic metres of waste collected in Western Australia over a period of 30 years became 44 cubic metres when it was conditioned and packaged for burial.[71]

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66 Samuel, Transcript of Evidence, p. 390

67 Ibid, p. 390

68 Rawson, Transcript of Evidence, p. 27

69 Hochman, Transcript of Evidence, p. 214

70 Paix, Transcript of Evidence, p. 216

71 Peebles, Transcript of Evidence, p. 843

The total volume of radioactive waste in Australia is given as about 3000 cubic metres, of which 2000 has extremely low activity.[72]

3.49 The Committee notes that many State and Territory governments and institutions have made considerable progress since 1986 in identifying and reducing their radioactive waste holdings. There has also been some progress in the registration of radioactive materials. In Victoria all sealed sources are now registered and all unsealed sources are listed on a license.[73] The Committee was told that this year unsealed sources of radioactive materials used in laboratories in New South Wales will need to be registered and:

> that will bring an awful lot of things out of the woodwork.[74]

3.50 The Department of Foreign Affairs and Trade told the Committee that it would like contracting parties to the RADWASS Convention to be required to report on radioactive waste volumes.[75] The Committee believes that Australia should urgently prepare an up to date national inventory reflecting the changes mentioned in this report and other changes since 1986. The Committee does not believe that the plans for a national facility should proceed on the basis of the 1986 inventory.

3.51 Further the Committee believes that an up to date national inventory would promote a national approach to finding markets and recycling or reuse opportunities.

Recommendation 10

The Committee recommends that an up to date inventory of all existing and potential radioactive waste be prepared and that this be maintained to detect any changes to the current accumulation rates.

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72 Rawson, Transcript of Evidence, p. 32

73 Victorian Government, Submission No. 37, p. 4

74 Collins, Transcript of Evidence, p. 772

75 Smith, Transcript of Evidence, p. 663