Submission

to

Senate Employment, Workplace Relations and Education Legislation Committee

Inquiry into the Commonwealth Radioactive Waste Management Bill 2005

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The Chair - Senator Judith Troeth
Senate Employment, Workplace Relations and Education Committee
Inquiry into Commonwealth Radioactive Waste Management Bill 2005
Parliament House
Canberra ACT 2600

18 November 2005

Dear Senator Troeth,

Please find the attached submission to the Inquiry from the Medical Association for Prevention of War (Australia).

We would be pleased to provide any clarification or expansion on the issues raised in this submission. We understand that a public hearing on the bill will be held in Canberra on Tuesday 22 November. MAPW would greatly appreciate the opportunity to address this hearing by teleconference from Alice Springs where a delegation of MAPW doctors will be meeting with decision makers and community groups to discuss this issue. We have made enquiries and have had teleconferencing facilities made available for us on the Tuesday.

Please contact the MAPW National Office on (03) 8344 1637 or my mobile directly on 0428 616 245 to discuss this further.

Yours sincerely,

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NUCLEAR MEDICINE AND RADIOACTIVE WASTE: our values and priorities

MEDICAL ASSOCIATION FOR PREVENTION OF WAR (AUSTRALIA)

submission to

Senate Employment, Workplace Relations and Education Committee Enquiry into the Commonwealth Radioactive Waste Management Bill 2005 and Commonwealth Radioactive Waste Management (Related Amendment) Bill 2005

NUCLEAR MEDICINE AND RADIOACTIVE WASTE: our values and priorities

Medical Association for Prevention of War
Mission Statement

MAPW, the Australian affiliate of the global federation, International Physicians for the Prevention of Nuclear War, affirms the mission statement of IPPNW as its own:

"IPPNW is a non-partisan international federation of physicians' organisations dedicated to research, education and advocacy relevant to the prevention of nuclear war. To this end, IPPNW seeks to prevent all wars, to promote non-violent conflict resolution and to minimise the effects of war on health, development and the environment."

Introduction

A CENTRALISED FACILITY?

In July this year the Federal government announced that it proposed to locate a centralised radioactive waste facility at one of three sites in the Northern Territory. Based on information provided by the Commonwealth, the facility would be used to store Australia's highest grade nuclear waste. All radioactive waste produced by the Commonwealth Departments, agencies and statutory bodies, including the Lucas Heights Nuclear Reactor and any military ordinance would be stored at the facility. From 2011 the Nuclear Facility would also house spent nuclear fuel rods returned from France and Scotland.

At present the Commonwealth Government owns 3 600 cubic metres of low level radioactive waste and 400 cubic metres of intermediate level radioactive waste. Each year, about 30 cubic metres of low level waste and about three cubic metres of intermediate level waste is generated. The decommissioning of the current Lucas Height Nuclear Reactor will generate up to 2 500 and 150 cubic metres of low and intermediate level radioactive waste, respectively.

MEDICAL RESPONSIBILITY

As doctors and medical scientists we are well aware of the importance of responsible, well thought-out management of all toxic wastes. As long as we deliver nuclear medicine services we will generate some radioactive waste at medical facilities (hospitals and medical imaging services) and in cyclotrons and/or nuclear reactors. Cyclotrons have the advantage of much lower waste production. Many of our members are engaged in the utilization of radioactive isotopes for diagnosis and treatment, as referring clinicians, as imaging specialists and as therapists.

Radioactive waste management necessitates particular scrutiny because of its long-term threat to human health. Long-term security of radioactive waste is essential: but this does not inherently imply *centralised remote geological disposal*.

Centralised remote geological disposal is a political strategy, not a health imperative.

Recommendations

BEST PRACTICE

Best-practice radioactive waste management demands:

- **minimization of waste generation**:
  - termination of the nuclear reactor program at Lucas Heights. Australia's world-class nuclear medicine capability can be sustained by a combination of importation and local isotope generation - as occurs during shutdown periods of up to three months at the current HIFAR reactor without any adverse medical consequences. (see the enclosed MAPW report "A New Clear Direction" for more detail)
  - Increased research and development of non-reactor technologies for the production of medical isotopes
  - promotion of safer imaging technologies including MRI, advanced CT, ultrasound and positron emission tomography
- **minimization of transport**: waste management is preferably done on-site, in a retrievable and secure fashion.
- **secure, monitored, above ground storage:** which responsibly addresses the need to maximise long-term safety and does not preclude any improved storage options which become available in the future
- **community acceptance** of the management system (according to the principles promoted by the International Atomic Energy Agency - IAEA). This does not simply mean "consultation": the community must give *informed consent* to the facility.

DIALOGUE AND TRANSPARENCY

This last principle of "community acceptance" is a core feature of international 'best-practice': as illustrated in the following account of Sweden's advanced nuclear waste program:

"The special character of the nuclear waste issue will by necessity lead to a need for local understanding and support for the project in order to be able to construct and operate a repository ... It was judged necessary to create a participatory and voluntary process in order to achieve such understanding ... ***Dialogue and transparency is essential for a fair and successful decision process.*** *This can be as much of an important and difficult task as the questions concerning geology and technology."* Claes Thegerström, President of SKB, the Swedish Nuclear Fuel and Waste Management Co. (1)

By contrast the 'fast-track' approach of the Australian government has been characterized by deception and authoritarianism.

The Federal Environment minister assured Northern Territorians before the last election, that: *"... the Commonwealth is not pursuing any options anywhere on the mainland. So we can be quite categorical about that because the Northern Territory is on the mainland... so the Northern Territorians can take that as an absolute categorical assurance."* - Liberal Senator Ian Campbell, Minister for the Environment 30th September 2004

Prime Minister Howard affirmed a commitment to due process: *"the rights of the Territory will be no less respected than the rights of Australians in other parts of the Country"* [quoted by Chief Minister Clare Martin in her Open Letter to the Prime Minister]

The insincerity of these proclamations was revealed in the words of the Science Minister when plans to site the Radioactive waste facility in the NT were made public:

"Why on Earth can't people in the middle of nowhere have low level and intermediate level waste?" - Liberal MP Brendan Nelson, Minister for Science ABC TV, 15th July 2005

The advice of Canada's senior authority on nuclear waste management is poignant:

"How we approach this challenging public policy issue will say a lot about ***our values and priorities*** *as a society".* Elizabeth Dowdeswell, President of Canada's Nuclear Waste Management Organization (2)

Canada and Sweden are world leaders in the field of radioactive waste management and whilst their programs are far from flawless, their emphasis on *community acceptance* reflects very badly on Australia's current radioactive waste management approach.

RADIOACTIVE SECURITY

Whatever transpires in terms of Australia's long-term radioactive waste management, *all* facilities generating such wastes need to be as secure and safe as possible. Under the current proposals waste would be transported to the centralised facility only every few years anyway, so the *interim* storage has to be secure, i.e., its security needs to be every bit as rigorous as that of *any* centralised facility. There is no point having a fabulously fortified, impenetrable centralised facility if the radioactive materials at sites of generation or interim storage are any less secure. So if, as proponents of the centralised facility often intimate, current storage facilities for Australian radioactive waste are in some way inadequate or flawed, this should be a loud wake up call for the Australian Radiological Protection and Nuclear Safety Agency (ARPANSA) to rectify that situation, not a facile justification for building another facility out of sight and mind.

Any system is only as good as its weakest link.

MEDICAL NECESSITY?

Much has been made by nuclear reactor proponents of the *therapeutic* significance of medical isotopes, including the assertion that lives will be put at risk if the replacement research reactor project does not proceed. This claim has recently re-surfaced as the justification for siting Australia's 'national radioactive waste facility' in the Northern Territory.

For example,
"A delay (... in building the waste facility...) would severely limit the availability of life-saving radiopharmaceuticals used in the treatment of cardiovascular disease and early

intervention against cancer, particularly breast cancer." [Tolner/Scullion press release]

To which "lifesaving radiopharmaceuticals" are these men referring?

The principle radioisotope used in cardiovascular disease is **Thallium-201**, which is produced in a **cyclotron**. **Technetium-99** is also used in cardiovascular diagnosis, and is imported safely and reliably throughout Australia. (see below)

As for "early intervention against ... breast cancer": early *detection* relies on breast-self examination, clinical assessment and mammography (which employs **x-rays**, not nuclear medicine).

Early *treatment* is *surgical*.

Treatment of *later* stages of breast cancer, in addition to further surgery, *chemo*therapy and *external beam x-ray* therapy, sometimes employs radioisotope therapy in the form of "*brachytherapy*". This involves the insertion into diseased tissue of fine rods made of **iridium-192[Ir-192, T1/2: 74 days]** – which is readily importable. Some of Australia's leading cancer-treatment facilities obtain their iridium supplies from international suppliers in preference to the ANSTO product.

If there *were* a genuine problem with importation during the weeks and months when the Lucas Heights reactor is turned-off it would have surfaced long ago: our patients with metastatic breast carcimomata over the many years of our collective clinical practice would, presumably, have noticed.

They haven't.

NUCLEAR MEDICINE: A TROJAN HORSE?

In August 2004 MAPW released its assessment of the Research Reactor replacement project at Lucas Heights in Sydney. The detailed report – "A New Clear Direction" – concluded that a domestic nuclear reactor was NOT essential to the provision of nuclear medicine services in Australia.
There was no substantive response to the report from the proponents of the project.

The report recommended that the health of Australians will be best served by:

1. An immediate decision not to proceed with the development and licensing of the new $350 million nuclear reactor in Sydney

2. An immediate decision to switch the existing reactor to half-power, a level at which it could still produce medical isotopes. This would extend its life until at least 2007 and provide Australia with extra transition time to put in place the measures detailed in this report, to promote non-reactor based technologies and ensure the continuation of a first-class nuclear medicine sector

3. Encouraging cutting-edge technologies, including PET, MRI and advanced CT, which are already reducing our reliance on reactor-based nuclear medicine procedures

4. The elimination of skewed Medicare rebating which subsidises reactor-based medical technologies and discourages alternative procedures

5. Government support for new cyclotrons to boost the domestic production of non-reactor isotopes and to supply the expanding PET sector

6. An increase in the number of imported isotopes

7. A Government-sponsored drive to build on successful overseas research and develop a commercial non-reactor means of producing the most common medical isotope, technetium

8. A comprehensive and public inquiry into the management of radioactive waste with the aim of adopting a national radioactive waste strategy based on international best practice, waste minimisation and the non-imposition of transport or waste facilities.

DIAGNOSTIC SERVICES

In particular, the report noted that over 95% of our nuclear medicine services are *diagnostic* in character. The bulk of these services (about 80%) employ **technetium-99 [Tc-99, T1/2: 6 hours]** as the radioisotope tracer. Although Tc-99 is currently generated in nuclear reactors, the product is readily available by importation, in the form of **molybdenum-99 [Mb-99, T1/2: 66 hours]** generators. Australia already imports some of its Tc-99 and this rises to 100% during shutdown periods for repair and maintenance at the Lucas Heights reactor – 12 weeks in 2000 and 40 days in 2004. During these periods of 100% importation there have been no confirmed reports of patient disadvantage. Japan – with an advanced nuclear medicine capability - imports most of its molybdenum/technetium from Canada. This is despite the fact that Japan possesses at least 18 research reactors of its own. Furthermore the 2 reactors in Canada from which Japan buys its isotopes already provide 60% of the world's medical isotope requirement and have the capacity to produce over 100%.

The 2001 Senate Committee into the Lucas Heights Reactor (p.10) stated that: "The Committee is not convinced, however, that logistical difficulties constitute a serious obstacle to the successful importation of radioisotopes. It listened to the argument that there now exists an efficient and reliable global supply and distribution network that could supply Australia with most of its medical radioisotopes, including technetium-99m in the form of molybdenum generators." The Committee concluded that "... no conclusive or compelling case has been established to support the proposed new reactor and ... the proposed new reactor should not proceed."

Diagnostic nuclear medical services employ a variety of other isotopes, the most common being generated in cyclotrons, not nuclear reactors:
thallium-201 [TI-201, T1/2: 73 hours] - (for testing cardiac function),

fluorine-18 [F-18, T1/2], (F-18 in fluoro-deoxy glucose [FDG] has become very important in detection of cancers and the monitoring of progress in their treatment, using Positron Emission Tomography scanning), and

indium-111 [In-111, T1/2: 2.8 days] (for specialist diagnostic studies, eg brain studies, infection and colon transit studies).
These three *non-reactor* radioisotopes confirm the "strong trend" identified by Australia's foremost nuclear advocate, the Uranium Information Centre. [RESOURCES]

The remaining diagnostic radioisotopes make a small contribution and are either importable or generated in (electrically-powered) particle accelerators. [APPENDIX I]

THERAPEUTIC SERVICES

The work-horse isotope in the *treatment* modality is **iodine 131 [I-131, T1/2: 8 days]**, which is used in the treatment of some thyroid cancers and in other non-malignant thyroid conditions. The USA imports all of its I-131 from Canada, despite possessing many of its own domestic research reactors). Australian nuclear medicine facilities have not reported adverse patient outcomes during the lengthy periods when the HIFAR reactor has been closed in the past five years.
Other therapeutic isotopes include

Iodine-125 [I-125, T1/2: 60 days], used in cancer brachytherapy (prostate and brain), also diagnostically to evaluate the filtration rate of kidneys and to diagnose deep vein thrombosis in the leg. It is also used in radioimmuno-assays to show the presence of hormones in tiny quantities.

Samarium-153 [Sm-153, T1/2: 47 hours] is effective in relieving the pain of secondary cancers in bone.

Sm-153 has a relatively short half-life, but has been imported in the past.
Alternatives to this isotope in the management of painful bony metastases include **strontium-89 [Sr-89, T1/2: 50 days]**.

There are several less significant therapeutic isotopes. [APPENDIX II]

EXPERIMENTAL PRACTICES

In addition to the aforementioned diagnostic and therapeutic radioisotopes, the remaining medically relevant radioisotopes fall into the category of *experimental* and although in some instances a domestic reactor would facilitate their availability, it is scare-mongering to suggest that difficulties in their acquisition would put Australian lives at risk.

CONCLUSION

Radioactive waste management necessitates particular scrutiny because of its long-term threat to human health. Long-term security of radioactive waste is essential: but this does not inherently imply centralised remote geological disposal. Centralised remote geological disposal is a political strategy, not a health imperative.

The "medical necessity" claim is worse than fallacious: it is deliberately misleading. It is a particularly contemptible manipulation of the emotions of the sick and the dying. In the real world of patient care, therapeutic isotopes make only a small contribution to overall management.

Australia needs a comprehensive and public inquiry into the management of radioactive waste with the aim of adopting a national radioactive waste strategy based on international best practice, waste minimisation and the non-imposition of transport or waste facilities.

REFERENCES

(1) *The Continuing Quest: Managing nuclear waste goes far beyond the science* - IAEA BULLETIN 46/1 June 2004

(2) *Down to earth and below* - IAEA BULLETIN 46/1 June 2004

OTHER SOURCES

- ANSTO WEBSITE: www.ansto.gov.au
- ARPANSA: http://www.arpansa.gov.au/
- www.geocities.com/jimgreen3/#isotopes
- DEP'T OF ENVIRONMENT, SCIENCE AND TRAINING: www.dest.gov.au/
- NT GOVERNMENT: www.nt.gov.au
- NATIONAL BREAST CANCER CENTRE: http://www.nbcc.org.au/
- PETER MACCALLUM CANCER CENTRE: http://www.petermac.org/
- URANIUM INFORMATION CENTRE: www.uic.com.au
- WORLD NUCLEAR ASSOCIATION: www.world-nuclear.org

APPENDIX I Additional Reactor-produced Radioisotopes (half-life indicated)

Bismuth-213 (46 min): Used for TAT.

Chromium-51 (28 d): Used to label red blood cells and quantify gastro-intestinal protein loss.

Cobalt-60 (10.5 mth): Formerly used for external beam radiotherapy.

Copper-64 (13 h): Used to study genetic diseases affecting copper metabolism, such as Wilson's and Menke's diseases.

Dysprosium-165 (2 h): Used as an aggregated hydroxide for synovectomy treatment of arthritis.

Erbium-169 (9.4 d): Use for relieving arthritis pain in synovial joints.

Holmium-166 (26 h): Being developed for diagnosis and treatment of liver tumours.

Iron-59 (46 d): Used in studies of iron metabolism in the spleen.

Lutetium-177 (6.7 d): Lu-177 is increasingly important as it emits just enough gamma for imaging while the beta radiation does the therapy on small (eg endocrine) tumours. Its half-life is long enough to allow sophisticated preparation for use.

Palladium-103 (17 d): Used to make brachytherapy permanent implant seeds for early stage prostate cancer.

Phosphorus-32 (14 d): Used in the treatment of polycythemia vera (excess red blood cells). Beta emitter.

Potassium-42 (12 h): Used for the determination of exchangeable potassium in coronary blood flow.

Rhenium-186 (3.8 d): Used for pain relief in bone cancer. Beta emitter with weak gamma for imaging.

Rhenium-188 (17 h): Used to beta irradiate coronary arteries from an angioplasty balloon.

Selenium-75 (120 d): Used in the form of seleno-methionine to study the production of digestive enzymes.

Sodium-24 (15 h): For studies of electrolytes within the body.

Xenon-133 (5 d): Used for pulmonary (lung) ventilation studies.

Ytterbium-169 (32 d): Used for cerebrospinal fluid studies in the brain.

Ytterbium-177 (1.9 h): Progenitor of Lu-177.

Yttrium-90 (64 h): Used for cancer brachytherapy and as silicate colloid for the relieving the pain of arthritis in larger synovial joints. Pure beta emitter.

Radioisotopes of caesium, gold and ruthenium are also used in brachytherapy.

APPENDIX II Additional Cyclotron-produced Radioisotopes

Carbon-11, Nitrogen-13, Oxygen-15, Fluorine-18:
These are positron emitters used in PET for studying brain physiology and pathology, in particular for localising epileptic focus, and in dementia, psychiatry and neuropharmacology studies. They also have a significant role in cardiology. Cobalt-57 (272 d): Used as a marker to estimate organ size and for in-vitro diagnostic kits.

Gallium-67 (78 h): Used for tumour imaging and localisation of inflammatory lesions (infections).

Indium-111 (2.8 d): Used for specialist diagnostic studies, eg brain studies, infection and colon transit studies.

Iodine-123 (13 h): Increasingly used for diagnosis of thyroid function, it is a gamma emitter without the beta radiation of I-131.

Krypton-81m (13 sec) from Rubidium-81 (4.6 h): Kr-81m gas can yield functional images of pulmonary ventilation, e.g. in asthmatic patients, and for the early diagnosis of lung diseases and function.

Rubidium-82 (65 h): Convenient PET agent in myocardial perfusion imaging.

Strontium-92 (25 d): Used as the 'parent' in a generator to produce Rb-82.

Thallium-201 (73 h): Used for diagnosis of coronary artery disease other heart conditions such as heart muscle death and for location of low-grade lymphomas.