

16.01.01

To: Dr. John Loy,
C.E.O.,
A.R.P.A.N.S.A.

Dear John,
herewith my report, as promised, re the Public Forum on the proposed Replacement Research Reactor. Apologies for the delay, and my thanks once again for the opportunity to be involved in a stimulating and challenging process.

Yours sincerely,

Bill.



**Medical Association for
Prevention of War, Australia**

President

Dr. Susan Wareham MBBS
3 Katz Place, Spence ACT 2615
Phone (h) (02) 6258 3743 (w) (02) 6241 6161

Vice-Presidents

Dr. Harry Cohen AM, MBBS, FRACOG
Carson House, 121 Railway Pde
Subiaco WA 6008
Phone (h) (08) 9386 5268 (w) (08) 9381 9729

Dr. Tilman Ruff MB BS(Hons), FRACP
52 Sussex St, Brighton VIC 3186
Phone (h): (03) 9592 8643 (w) (03) 9721 4343

Prof. Fred Mendelsohn MD, PhD, FRACP
Howard Florey Institute, University of
Melbourne, Parkville VIC 3052
Phone (h) (03) 9347 2651 (w) (03) 8344 7333

Secretary

Dr. Carole Wigg MBBS, MBioeth.
34 Warringah Cres., Eltham VIC 3095
Phone (h) (03) 9439 7272 (w) (03) 9844 1943

Treasurer

Dr. Peter Sutherland MD, FRACP, FCCP
37 Chrystobel Cres., Hawthorn VIC 3122
Phone (h) (03) 9818 4706 (w) (03) 9328 4285

IPPNW Councillor

Prof. Ian Maddocks MD, FRACP
215A The Esplanade, Seacliff SA 5049
Phone (h) (08) 8296 6618

Deputy International Councillors

Dr. Bill Williams MBBS
PO Box 158, Torquay VIC 3222
Phone (h) (03) 5261 6245 (w) (03) 5261 3001

Dr. Rachel Darken MBBS, DPM
19 Dover St, Wilston QLD 4051
Phone (h) (07) 3356 6817

Web page: www.mapw.org.au

email: mapw@mapw.org.au

Branch Coordinators

Australian Capital Territory (MAPW)
Dr. Elizabeth O'Leary MBBS, MPH
94 Hawkesbury Cres., Farrer ACT 2607
Phone (h) (02) 6286 3310 (w) (02) 6201 6336

*New South Wales (Health Professionals
for Global Responsibility)*

Dr. John Ward MBBS, MSc, FRACP
PO Box 119, Wallsend NSW 2287
Phone (w) (02) 4924 6004

Northern Territory (MAPW)

Dr. Peter Tait MBBS, FRACGP
PO Box 2202, Alice Springs NT 0871
Phone (h) (08) 8952 6160 (w) (08) 8951 4444

Queensland (MAPW)

Dr. Rachel Darken MBBS, DPM

South Australia (Medact)

Dr. Jason Garrood MBBS, RCOG, FACRRM
3 Stephen St, Mt Barker SA 5251
Phone (h) (08) 8398 3894 (w) (08) 8339 2677

Tasmania (Medact)

Dr. Dougald McLean MD, FRANZCP
12 Derwent Waters, Claremont TAS 7011
Phone (h) (03) 6249 5778

Victoria (MAPW)

Dr. Lou Irving MBBS, FRACP, FCCP
30 Downes Ave, Brighton VIC 3186
Phone (h) (03) 9596 6561 (w) (03) 9496 3685

Western Australia (MAPW)

A. Prof. Alfred Graaug MBBS, FRACP
17 Thomson Rd, Claremont WA 6010
Phone (h) (08) 9384 3251 (w) (08) 9340 2050

Australian affiliate of International Physicians
for the Prevention of Nuclear War

REPORT ON ARPANSA PUBLIC FORUM (14th & 17th December 2001) TO ASSESS ANSTO'S APPLICATION TO CONSTRUCT A REPLACEMENT RESEARCH REACTOR AT LUCAS HEIGHTS.

INTRODUCTION

Preparation for the public forum included a general review of the recent epidemiological and radiation-biology data on the health hazards of ionising radiation, and analysis of the following documents in particular:

- Preliminary Safety analysis Report (PSAR), Probabilistic Safety Assessment (PSA), and Q's and A's to the PSAR and PSA
- Safety Evaluation Report (SER) for Siting Licence
- International Peer Review of PSAR and Q's and A's
- Senate Inquiry Report into Need for RRR (May 2001)
- First Round submissions re Construction Licence application
- ARPANSA website documentation
- ANSTO website documentation

The panel heard detailed presentations from opponents and proponents of the replacement research reactor (RRR) and questioned presenters accordingly. In determining the advisability of granting a Construction Licence, the following principles are paramount:

- "... the CEO of ARPANSA... must take into account **international best practice** in relation to radiation protection and nuclear safety" (*Section 32(3) of ARPANS Act 1998*)
- "Whether the information establishes that the proposed conduct can be carried out **without undue risk to the health and safety of people, and to the environment.**" (*ARPANS Regulation 41(3)*)
- "Whether the applicant has shown that the magnitude of the individual doses, the number of people exposed, and ***the likelihood that exposure will happen, are as low as reasonably achievable, having regard to economic and social factors.***"
- "... detailed review and acceptance of the **finalised plan (for Radioactive Waste Management** for the RRR), including contingency arrangements, would be required for any construction or operating licences for the reactor to be issued." (*3.4.3 Conclusion – ARPANSA Safety Evaluation Report on RRR siting application*)
- "Reactor construction should not be authorised until **arrangements for the management of spent fuel rods** from the replacement reactor have been **demonstrated to the satisfaction** of ARPANSA..." (Recommendation 26 - Minister for Environment and Heritage, March 1999)

- “The Minister for Industry, Science and Resources and the Minister for Health should give **timely consideration** to strategies for the **long-term management** and **eventual permanent disposal** of Australia’s long-term intermediate level nuclear wastes...” (Recommendation 27 - Minister for Environment and Heritage, March 1999)
- “Whether the applicant has shown that there is a **net benefit** from carrying out the conduct relating to the controlled facility.” (*Regulation 41(3)*)

For the following reasons, I advise that the applicant has **NOT** met these and other criteria in the context of the proposed reactor construction.

RECOMMENDATIONS.

RECOMMENDATION 1

Further consideration of the application requires full documentation, including radiological consequence analysis for major explosive impact on a suburban 20-megawatt pool-type reactor and spent fuel storage facility. This documentation should be made available to the public and subjected to detailed *independent* expert analysis as part of the construction licence application assessment. This assessment should include re-visiting the issues of design and defence-in-depth and must readdress ‘siting assessment’.

RECOMMENDATION 2.

In the light of the independent public review recommended in (1) above, the details of planning for an emergency response to a serious radiological emergency must be re-assessed - independently. This would include consideration of extensive distribution of potassium iodide, advice re preparation for and potential duration of sheltering, upgrading of medical (radiological) response capabilities and detailed evacuation instructions. The issues of grazing animals and property contamination must also be considered.

RECOMMENDATION 3.

ANSTO must document finalised authorisations for spent fuel rod processing in specified facilities that are currently engaged in an equivalent process. In line with the recommendation of the Senate Committee (May 2001), ANSTO should prepare and fully cost a contingency management plan for spent fuel conditioning and disposal within Australia.

RECOMMENDATION 4

ARPANSA should stipulate that DITR demonstrate public acceptance, local authority acceptance and State Government acceptance of the proposed National Store and consequent issues. Site finalisation and

public environment assessment should be mandatory before granting a construction licence and thus legitimising the production of further long-lived radiological toxins.

RECOMMENDATION 5

ARPANSA should call for a re-assessment of the costs and benefits of a RRR, taking heed of the findings of the Senate Inquiry, which recommended an independent public inquiry. Experts from senior scientific bodies such as CSIRO and ASTEC, as well as senior representatives from medical science would be able to provide an updated analysis, and thus advise ARPANSA (and the Commonwealth Government) re this issue of “net benefit”.

1. LOSS OF COOLANT / TERRORISM SCENARIOS

ANSTO has failed to provide adequate documentation illustrating the evidence-base for its categorical assertion that a loss of coolant and explosive damage to the spent fuel storage facility – including events of catastrophic sabotage – would have insignificant health consequences.

The PSAR asserts the following:

- “No **credible external event** has the potential to affect the safety of the Reactor Facility” (16.18)
- “... the estimated low probability of an aircraft crashing onto the Reactor facility **would not require the design of the reactor to withstand aircraft crashes**. Nevertheless, the impact of a lightweight aircraft has been placed within the design basis for the reactor core ... The design **worst case** external missile considered was a **light aircraft** ...” (16.14.1)
- “Sabotage is not amenable to probabilistic treatment but is countered by information from the intelligence agencies on its likelihood and by **adequate provisions in the design** ... The result of this (threat) assessment was that none of these attacks would threaten the **integrity of the reactor core** or create radioactive releases greater than those analysed from other beyond design basis accidents ... design of the facility is such that the response systems are **scalable** to meet **foreseeable changes** in the threat level.” (16.14.10)
- “Whilst the crash of a light aircraft is a design basis event, **crash of other aircraft** are not and **could be expected to result in core damage**.” (p.16.58)
- “No emergency counter-measures outside the facility, such as sheltering or evacuation, would be required in the event of nuclear accidents.” (p. 1.3)

In other words, the reactor is not designed to withstand a large aircraft crash, which could be expected to result in core damage. A deliberate multi-suicide/murder hijacking assault of this nature was NOT “foreseen” by the intelligence agencies and

“consultants in terrorist activity” at the time of the PSAR (i.e., pre-September 11) and hence neither the “response systems” nor the design have been “scaled” to the changed threat level.

A deliberate large aircraft crash *is* a foreseeable risk now and the siting and the design of the reactor must incorporate this. The Experts Mission to Review the PSAR (10.7.01 – 13/79) criticised the failure of the applicant to include “a variety of **potential human-induced events** in the design basis...” and that “... any possible adverse change in the present situation has not been considered ... The grillage provides partial protection from only one type of aircraft crash but **fails to serve as a protective envelope** for blast or impact loads in general. It is recommended to **review this decision** on the basis of updated data and calculations as well as projections for the **potential development** in the area that may change the present situation **unfavourably.**”

The situation has clearly changed “unfavourably”.

Mr Leask from ASNO drew attention to Information Circular 225, an IAEA guidance document, which details specific standards and measures that should be considered for physical protection of nuclear materials. He stated that this document “is likely to be further revised in 2002-2003” and that ASNO will then require ANSTO to “review and update its security plan as necessary to ensure it complies with best international practice regarding **physical protection.**”

Given the recent unforeseen developments in international terrorism and the likely major impact on international best practice response, any licence to construct a reactor should only be considered in the context of the *revised* version of INFCIRC 225. i.e., licencing should not pre-empt the international review of standards and safety measures.

ANSTO asserts that even a catastrophic explosion that ruptures the core, causing rapid loss of coolant, meltdown, vapourisation and explosive dispersal of the core contents would not result in **undue risk to the health and safety of people, and to the environment.** ANSTO is similarly dismissive of the hazard potential of explosive damage to storage facilities for radioactive waste, including spent fuel rods.

PROF. GARNETT: “... *doses to the public are less than, considerably less than, any dose that anybody normally operating facilities gets and they are way below what is required for any countermeasures off-site*”. (p.160, Forum transcript)

This assertion is staggeringly at odds with the assessment made by nuclear engineer and former ANSTO staff-member Mr Tony Wood in his submission:

MR. WOOD: “*With respect to the PSAR the bottom line is that we have an open pool reactor which, at any given time, will contain 500,000 Curies of Iodine131. We only have to let one quarter of 1% of this iodine escape to the atmosphere before the exposure dose at the exclusion boundary exceeds the*

recommended IAEA Generic Intervention Level for Iodine prophylaxis adopted by ARPANSA.”

I found this discrepancy disturbing and so challenged Mr Wood re his figures and their bases, which he later provided – see **Appendix 1**. Without detailed data it is impossible to judge the soundness of Professor Garnett’s assurances, but examination of the **available** information casts considerable doubt on their plausibility.

These assertions must be subjected to rigorous independent analysis prior to further consideration of the licence application.

There will inevitably be debate over quantitative analysis of the radiological consequences, but the *facts* (e.g., the inventory of stored wastes, including nature and amounts of nuclides such as plutonium, strontium, caesium, cobalt and iodine) and the *assumptions* employed in the modelling must be open to scrutiny.

Sydney-siders must be fully informed of the potential for explosive dispersal of significant quantities of long-lived carcinogens and mutagens into their suburbs and their food chain.

RECOMMENDATION 1

Further consideration of the application requires full documentation, including radiological consequence analysis for major explosive impact on a suburban 20-megawatt pool-type reactor and spent fuel storage facility. This documentation should be made available to the public and subjected to detailed *independent* expert analysis as part of the construction licence application assessment. This assessment should include re-visiting the issues of design and defence-in-depth and must readdress ‘siting assessment’.

2. EMERGENCY RESPONSE

“Condition 23 of the Minister for the Environment, flowing from the EIS process ... requires ANSTO to develop a **specific plan to facilitate public understanding** of the hazards and risks of the reactor, the **emergency arrangements** and their implications for the community” (*ARPANSA Safety Evaluation report*)

As detailed in **(1)** above, ANSTO has not facilitated public understanding of the hazards and risks of the reactor.

Furthermore, ANSTO has not provided adequate documentation in the public arena to conclude that the **emergency planning process** is appropriate or adequate. Representatives of the Sutherland Shire Council (Ms Genevieve Rankin and Dr Gary Smith) described unsatisfactory procedures to date in regard to public consultation and planning. Mr Tony Wood gave credible evidence, with detailed reference to international experience and best practice re emergency planning that seriously questions ANSTO’s performance. On several occasions Mr Wood echoed the critique

of obfuscation and secrecy levelled at ANSTO by more habitual opponents at the Forum on the Friday. These comments reflect the finding of the Senate committee of inquiry (May 2001) that ANSTO's "attitude seems to stem from a culture of secrecy so embedded that it has lost sight of its responsibility to be accountable to parliament." This attitude was evident in ANSTO's disinclination to be forthcoming on the matters of loss of coolant, sabotage consequences, or the legitimate concerns of the public re potential radionuclide dispersal and emergency response.

The repeated invocation by ANSTO to consult their website re emergency plans, which they describe as "appropriate and adequate", are misleading and trivialising.

For example,

- if, as the ANSTO website declares, potassium iodide will be available to emergency workers in the event of a serious incident, **on what grounds** has the assumption been made that emergency workers might require medication, but not the general public?
- if – as this suggests – there IS potential radiological risk to offsite personnel, what is the estimated risk and the potential dose to the public?
- if an event requiring distribution of KI to SES workers occurs - how long should public sheltering persist, who would require evacuation, to where and when?

Mr Wood opined that the effects of a significant incident at the reactor – including nuclide dispersal – could be ameliorated by adequate preparation and planning. He indicated that "international best practice" entails distribution of potassium iodide to target persons within one hour of exposure.

His challenge to ANSTO to "tell the truth, even if it is unpalatable" is timely and appropriate.

RECOMMENDATION 2.

In the light of the independent public review recommended in (1) above, the details of planning for an emergency response to a serious radiological emergency must be re-assessed - independently. This would include consideration of extensive distribution of potassium iodide, advice re preparation for and potential duration of sheltering, upgrading of medical (radiological) response capabilities and detailed evacuation instructions. The issues of grazing animals and property contamination must also be considered.

3. SPENT FUEL PROCESSING

ARPANSA cannot grant a construction licence for the proposed RRR until a "**finalised plan for radioactive waste management**" exists, and the "arrangements" for spent fuel rod management have been demonstrated to be "**satisfactory**".

ANSTO has failed to articulate a “finalised plan” for the processing of spent fuel. The COGEMA / INVAP / ?third country / (home-conditioning) flow-chart in their application constitutes an algorithm for contingencies – none of the options are “final” (i.e. definite, conclusive, absolute) ... all depend on numerous anticipated developments (and are thus *contingency*, not finalised plans).

The proponents have failed to demonstrate a secure contract with COGEMA to reprocess silicide fuel – partly as a result of uncertainty over the exact type of fuel to be used, as the preferred fuel type (uranium-molybdenum) is as yet unqualified:

PROF. GARNETT:

*“Uranium molybdenum fuel **development** is well under way...” (transcript, p.147)*

and

*“...the **development** process is going extremely well” (transcript, p.147)*

Furthermore, the evolving international reprocessing situation urges caution rather than optimism about this preferred fifty-year route.

Similarly, the Argentine option - described as a “fallback” position - is far from “finalised”. In an area of potential major hazard to human health such as radioactive waste management, the fallback position should be *at least* as secure as the preferred option. This one is even less secure: the process INVAP has proposed is not currently operational, the process is unauthorised and the facility itself is not currently engaged in equivalent, let alone identical operations ... INVAP is simply *proposing* to condition spent fuel from Australia. This process is described by INVAP employee Mr Gerbino as a “*novel method* to eventually process (Argentine) research reactor fuel elements ... the site for an *eventual* full scale plant is under study...”

This lack of finality was underscored by the INVAP representative at the forum:

DR JOHN LOY:

“Okay, so there has been no conditioning process for long-term storage?”

MR PABLO ABBATE

“No.”

(transcript, p.149)

Furthermore, the Argentine constitution (Statute #41) clearly prohibits the importation of foreign radioactive waste. What the courts will make of the disagreement about definitions (and surely Australian spent fuel is to be processed for storage and disposal, not for further use...) remains to be seen, but protracted litigation should be anticipated.

This is not a ‘fallback position’; it is a ‘stopgap’ measure.

Various presenters referred to the parlous state of the Argentine political and economic situation: assurances were given by the INVAP representative and by ANSTO – with much force being attributed to “*presidential assurances*” (transcript, p.150-1).

Furthermore, according to

PROF. GARNETT:

“The whole contract has commercial guarantees backed up by commercial banks. The letter from the President to the Prime Minister and the Government guarantee is an extra icing on the cake...” (p. 168)

Since December 17th, the situation has deteriorated from instability and bankruptcy, through crisis, to state of emergency, presidential resignation and helicopter evacuation. At the time of writing, the presidential palace and the parliament are being sacked and burned by disgruntled Argentines, while the third president in one week has resigned.

The suitability of Argentina as the provider of a nuclear reactor needs to be fully reviewed in light of these developments. Simple assurances are no longer acceptable.

Prof. Garnett dismissed other management options as being barely worthy of discussion, asserting that there would be no problem processing Australian spent fuel in any of a number of countries. This is a trivialisation of the issue – most **unsatisfactory** - especially given ANSTO’s inability to demonstrate a secure contract for processing the spent fuel in the first instance.

Her absolute denial of intention or capacity to ‘home-condition’ merely reduces the number of contingencies.

Plans which “are dependent on a range of probabilities” – e.g. which fuel will be used? will the French reprocess it?, when will Argentina have available resources? - are no more than “contingency” plans. (def. Shorter Oxford)

If there is no definite, secure mechanism for managing spent fuel waste, then that waste should not be created in the first place.

RECOMMENDATION 3.

ANSTO must document finalised authorisations for spent fuel rod processing in specified facilities that are currently engaged in an equivalent process.

In line with the recommendation of the Senate Committee (May 2001), ANSTO should prepare and fully cost a contingency management plan for spent fuel conditioning and disposal within Australia.

4. WASTE STORAGE AND DISPOSAL

The Department of Industry, Tourism and Resources presented detailed options for the management of Low-Level (LL) and Long-Lived Intermediate-Level Waste (LLILW). However, none of these potential management routes are ‘long-term’, ‘finalised’ or ‘eventual permanent’.

The LL-repository is not built, its siting is still open to conjecture (despite preferences being allocated) and there is substantial public opposition.

The LLIL waste–repository is even less secure: opposed by state and local legislature, the public at large and the representative body of senior traditional law-women.

It is unconscionable that the regulator could permit construction of a nuclear reactor, which will produce toxic long-lived waste for 50 years, without a definite storage/disposal facility sited or constructed, let alone operational.

The DITR presentation accurately reflected its submission to ARPANSA: a detailed description of a range of possibilities and a proposed course of action. The current status of this “plan” could be summed-up as:

“ Herewith a prospective date for an announcement of a proposed site for the temporary management of long-lived waste ”.

Not even the date for the announcement is finalised... The national LLIL waste store project is in the preliminary planning phase: pre-siting, pre-EIS, pre-authorisation. The scheme is calculated to generate a semblance of finality and thus to allay grave and legitimate concerns about the unsolved dilemma of managing highly toxic long-lived waste. But these concerns will persist and grow as long as a satisfactory solution is unavailable.

The Minister’s recommendation re “**timely consideration**” of “**long-term**” management and “**eventual permanent**” **disposal** strategies for Australia’s long-term intermediate level nuclear wastes acknowledges the enormous burden of responsibility this waste constitutes, and the fact that long-term is just that: millenia, not decades.

There *is* no satisfactory **eventual permanent disposal** solution to the hazards posed by long-lived alpha-emitters. There is considerable *optimism* in the rhetoric of DITR and of ANSTO on this matter, but optimism is no substitute for scientific rigour.

Vast resources have been devoted to the dilemma of ‘eventual permanent disposal’ over the past half century, without satisfactory conclusion. To suggest that ‘it’s just a matter of time’ is simply wishful thinking.

ARPANSA’s brief is to ensure that there is no “undue risk to the health and safety of people”. This includes the stipulation that “... **acceptance** of the **finalised plan (for Radioactive Waste Management** for the RRR) ... would be required for any construction or operating licences for the reactor to be issued.

RECOMMENDATION 4

ARPANSA should stipulate that DITR demonstrate public acceptance, local authority acceptance and State Government acceptance of the proposed National Store and consequent issues. Site finalisation and public environment assessment should be mandatory before granting a construction licence and thus legitimising the production of further long-lived radiological toxins.

5. NET BENEFIT

At the time of granting the “siting licence”, ARPANSA stated that it was satisfied that there was a net benefit in the RRR project:

“... the benefits of the project... exceed the detriment that may arise from the exposures of people to radiation ...”

‘Net benefit’ implies an equation that weighs the risks and their costs against the potential benefits:

“... practices that lead to an increased exposure to radiation must be **justified** to ensure their **overall benefits outweigh the additional risk** due to the increased exposure ...’ (*ARPANSA Safety Evaluation Report – 3.3.2*)

This is a dynamic equation: when the values attributed to either side of the equation alter, the analysis must be re-quantified.

No evidence was presented to the forum that would substantially re-value the factors on the benefit side – national interest, neutron-beam research, isotope production. On the risk-costs side however, there has certainly been a re-valuation, weighting the equation heavily in that direction, since the catastrophic events of September 11. Several presenters to the forum indicated that Australia faces a greater threat of terrorist activity than previously estimated and that nuclear reactors are a clear target (confirmed by the CEO of the IAEA).

Despite suggestions by ANSTO (and ANA) that the prospect of a commercial airliner crashing into the reactor had been factored into the PSAR, no evidence was presented to that effect. Vague references to large aircraft crashes in the EIS for the Holsworthy runway project have been cited elsewhere, but no documentation has been forthcoming.

And so more queries arise:

i/. Nobody – not even ANSTO – could honestly claim that deliberate, multi-suicide / murder utilising a commercial airliner as a weapon of mass destruction was factored into the PSAR or into the broader cost/benefit analysis.

The risk has *changed*. And so the net benefit calculation must have changed as well.

This must be re-calculated.

ii/. The PSAR describes the “grillage” structure over the reactor building that is designed to impede / withstand the impact of a Cessna. If there are design features to accommodate light-plane crashes, then why is there no requirement for design features to accommodate large plane crashes?

If, as ANSTO has dubiously asserted, there would be no undue health risk to the public in the event of a large plane crash, why was it considered necessary to include design features that are aimed at reducing the impact of a small plane?

RECOMMENDATION 5

ARPANSA should call for a re-assessment of the costs and benefits of a RRR, taking heed of the findings of the Senate Inquiry, which recommended an independent public inquiry. Experts from senior scientific bodies such as CSIRO and ASTEC, as well as senior representatives from medical science would be able to provide an updated analysis, and thus advise ARPANSA (and the Commonwealth Government) re this issue of “net benefit”.

Is the recent augmentation in risk still outweighed by the projected benefits?

Dr. Bill Williams, M.B., B.S.
Deputy International Councillor
Medical Association for Prevention of
War (Australia)

APPENDIX 1.

MR. WOOD (personal communication – emphasis added):

1) “... the EIS has given a number for the Iodine 131 inventory for this reactor. See EIS Vol 2 Appendix G Page 25
Figure for Iodine 131 is 1.82×10^{16} Bq (Bequerels) 1 Curie (Ci) = 3.7×10^{10} Bq
That is **491,892 Curies**

2). Over the years many safety studies have been done for HIFAR and I refer to one of the more recent ones which was presented as report DR 22. HIFAR Safety Analysis: Frequency and Off Site Consequences of Fault Sequences Initiated by within-plant Failures.

In this one it was assumed in a worst case scenario 4.6 % of the iodine 131 escapes to the atmosphere. Once the iodine release number is known is a fairly standard calculation to determine the doses down wind. Normally stable meteorological conditions are assumed at least for part of the time with temperature inversion and wind-speed of 1 m per second. This is very common in Sydney at night.

This calculation for HIFAR showed that the dose to the child thyroid at the 1.6 km boundary would be 1900mSv.

To determine the percentage release to give a dose at the boundary of 100mSv [ARPANSA has adopted the IAEA Generic Intervention level for Iodine prophylaxis which is 100 mSV]:

If 4.6% of the inventory delivers 1900mSv at the boundary

To determine what fraction release gives 100mSv at the boundary

$100/1900$ of 4.6% = .24%

That is if $\frac{1}{4}$ of 1% of iodine escapes and no countermeasures are taken one intervention level, (100mSv) will be received at the boundary.

There was not sufficient information in the PSAR for me to convert magnitude of release to dose but this information was available from DR22. It was valid to use this because the fissions products would behave the same for the two reactors except the new one had double the inventory.

To be conservative I ignored this factor of 2 so **the real number would be one eighth of 1% instead of the one quarter of 1% I claimed for the Generic Intervention limit to be reached.**