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TO: John Loy, CEO of ARPANSA
FROM: Robert J. Budnitz
SUBJECT: Report following the ARPANSA Forum of December 14 and 17

I was pleased to be able to participate in the Forum that you chaired on December 14 and 17 in Sydney. Thank you for the invitation, and for your and your ARPANSA colleagues' gracious hospitality during my trip to Sydney.

This is the report that you requested of me, with my follow-up observations and recommendations. I understand that this report will go into the public record and I have written it with that in mind. I will organize my comments by discussing a series of technical topics. I wish to point out up-front that there is no significance to the ordering of these topics -- they are approximately in the order in which they were raised during the Forum. I have selected these topics based on my conclusion that there is an important issue to clarify, or an important action that ARPANSA needs to take, or in some cases that there is an action that another party needs to take or has committed to take which I think is worthy of comment.

Also, in my consideration of what ARPANSA should do, or what the applicant (ANSTO) or any other interested party should do, I have used as my benchmark that Australia deserves nothing less than "world's best practice" in all of its endeavors surrounding the ARPANSA licensing decision for the proposed Replacement Research Reactor.

ARPANSA's Review of Security Issues Surrounding the RRR

Everything on this topic is somehow different in light of heightened sensitivities since the September 11 terrorist attacks in the US. First, I was struck by the even-handedness with which ARPANSA has approached this issue so far, including your public statement of 9 November 2001. During the Forum, I was encouraged that everybody seemed to understand that ARPANSA needs to keep vital security information out of the public domain, as described by yourself and by Andrew Leask, your government colleague from ASNO. However, to me it seems important that ARPANSA try to describe as much as it can along the lines of what analyses are being done, what security measures are being taken, and where the responsibilities lie, in a way that provides as much information as feasible short of releasing information useful to our enemies. I observed mistrust of the government among some of the presenters, and of course some of that cannot be alleviated by anything you or ASNO can do or say. But a lot of it can be alleviated.

What I recommend is releasing information, perhaps in a widely disseminated and publicized joint ARPANSA-ASNO release, about topics such as the general categories of threats that you consider; the types of measures you use (physical security, intelligence-gathering, analysis of the capabilities of the security system); the types of analyses of the capabilities of the physical reactor plant to withstand certain threats; etc. The information would amplify on your excellent public statement of 9 November. While this information may already be in the public domain in one form or another (Leask mentioned a lot of it in his prepared remarks, such as the 10 ASNO-ARPANSA agreed security plan "assessment criteria"), in my view (based in part on our recent experience on these matters here in the US) it would help to have a continuing visible and public display of your position and activities with specific reference to the concerns since September 11.

In particular, I was interested to learn during ANSTO's (Helen Garnett's) presentation to the Forum that they have done a new analysis apparently showing that radiological impacts from a commercial aircraft crashing into the proposed RRR, similar to what happened in New York three months ago, would not be large enough to modify their existing conclusion that no offsite emergency preparedness is necessary. I am sure, of course, that you and ASNO will review this analysis. Whatever the outcome of that review, discussing its broad outlines in public could go a long way toward reinforcing that the Government is acting responsibly. In your statement of 9 November, you already stated that you "would expect that at least the outcomes of the site assessment including analyses of the consequences of acts of sabotage could be made public." Perhaps the information I have suggested above could be a part of whatever public statement you will make (when it is timely) about the consequences aspect.

How this affects your deliberations on the emergency preparedness issue is part of my next topic.

Emergency Preparedness and Offsite Radiological Consequences

This set of issues is among the most complex that ARPANSA faces in its deliberations on the proposed RRR. ANSTO's position, based on its analysis as presented in the PSAR as well as in other reports, such as its analysis vis-à-vis the "Reference Accident", is that offsite emergency preparedness measures are not necessary. (The measures, which are routinely required for much larger nuclear facilities such as power reactors, might include planning for evacuation and/or sheltering, training of emergency and hospital personnel, distribution of potassium-iodide, and so on.) ANSTO's position relies on its having found only very low probabilities and very small radiological releases for the accidents that it analyzed. Several of the Forum presenters, however, did not accept ANSTO's position. Some of them did not accept it even without consideration of purposeful-terrorist threats --- they apparently want ANSTO to implement an emergency-preparedness scheme independent of how small the probabilities or consequences of accidents might be, and some seem unwilling to accept reliance on any accident analysis that might support the opposite position. However, there is no doubt that the September 11 terrorist attacks in the US have changed some perspectives, so that some presenters stated that even if ANSTO's claim were correct concerning accidental releases, the ANSTO position is invalid in light of the newly perceived terrorist threats.

I myself am willing to accept that, if analysis shows that all accidents that might

release enough radioactivity to be a public-health concern have annual frequencies below ARPANSA's declared de-minimis cut-off, then no offsite preparedness measures are needed to protect against such accidents. I have reviewed ANSTO's analyses on this topic and find them reasonable, but my review was not as complete as ARPANSA's will need to be.

Concerning the potential releases from terrorist attacks of various types and sizes, I leave it to ARPANSA (with ASNO's help) to figure out what is needed to protect the public. This is as much a matter of Australian public policy as of technical analysis, although of course it must be illuminated by whatever analyses you believe should be done. In my country there is work underway right now to reevaluate these issues, as there is around the world. My only advice here is that Australia ought to learn as much as it can from the analyses done abroad.

Back to accidents: Finally, during the Forum I urged ANSTO to present in public whatever it could as to the extent of offsite radiological dispersion and effects from the various accidents of concern. Surely, there is a good public-policy reason to analyze and then to describe to the public the consequences of postulated accidents, so that members of the public can review them technically, and also can judge for themselves about what they imply. In particular, I stated directly during the Forum that although I am not a practitioner of the science of consequence analysis I believe that claims of important offsite consequences out to 80 kilometers from RRR accidents are unlikely to be correct, based on my familiarity with similar analyses for much larger power reactors. (Neither the source of energy nor the source of radionuclides needed for such large-distance effects seem to be present within the proposed RRR.) But I could be wrong here vis-à-vis the proposed RRR.

I hope that ANSTO will release its analyses on this topic publicly, but whether or not they do, I think it important that ARPANSA do its own review of both the ANSTO analyses and any other consequences analyses presented to it by other interested parties. To me, it is important to clarify to the public whether (or not) important offsite radiological-health consequences out to distances like 80 kilometers, as claimed by some, are a realistic picture or an entirely incorrect picture of what they might need to deal with.

Part of this whole issue is a decision on which "worst case" scenarios to evaluate, be they accidents or purposeful-terrorist scenarios. There is no single "worst" scenario, of course --- to choose scenarios for evaluation one absolutely must apply probabilistic considerations within some annual-frequency range and exclude those of lower potential annual frequencies. On this topic, I believe that ARPANSA's original guidance on the frequency cutoffs makes good sense -- it certainly is comparable to best practice around the world in this arena. Thus whether to include certain LOCA scenarios, as some of the presenters at the Forum requested, comes down to determining whether these scenarios meet the cutoff criteria.

Earthquake Safety -- Pool Integrity

In my written submittal for Sutherland Shire Council, I commented extensively on the issue of earthquake safety, and I feel it unnecessary to repeat those comments here, although it is an area where I have extensive experience. One topic is very much worth discussing here, however. Specifically, because of the pool's special safety role it is very important that its integrity under seismic loads have

considerable margin above the design-basis earthquake. During the Forum, ANSTO stated that their analyses find considerable margin. It will be important for ARPANSA to review these analyses in detail, including trying to ascertain how realistic they are, where approximations are made and how important they are, and what unanalyzed margins or compromises-to-the-margin remain.

If the claim of large margins is valid, the margins provide a strong barrier to accidents, because a large earthquake is one of the few events that could compromise pool integrity. A strong seismic design also provides strength against other postulated events. Of course, all structures have some margin above their design basis if the design is implemented correctly --- but it is not clear to me whether ARPANSA has established a criterion as to how much margin above the design basis is appropriate for the pool. (The USNRC has not, for the comparable item in power reactors, the primary vessel -- that agency does however examine vessel integrity carefully using a number of methodologies to assure large margins.)

The PSA - Technical Issues

The PSA (probabilistic safety assessment) for the proposed RRR has certain weaknesses that came out in the Forum both during the presentations and the question-and-answer sessions. I was personally pleased by ANSTO's explicit recognition that they need to do further work to remedy these deficiencies and by their stated commitment to do so. Among the deficiencies are the absence of a fire PSA; the need to treat errors of commission better using the actual operating procedures once developed; the need to improve the aircraft-crash part of the PSA; and the need to address accidents during shutdown conditions. ANSTO also seemed to acknowledge some earlier criticisms, including my own, that the stated uncertainties in the numerical core-damage-frequency (CDF) numbers are too narrow, and need to be revisited; and that given the very low CDF value quoted, less than 10^{-7} per year for internal-events accidents, there is the need to revisit whether the PSA has screened out events that need to be included. (These last two issues were raised by me in my own submittal to ARPANSA through Sutherland Shire Council.) I believe that ARPANSA needs to review the PSA in detail with these issues in mind.

Seismic Issues

I reviewed the seismic aspects of the PSAR and of the PSA for Sutherland Shire Council and found them satisfactory. During the Forum, nothing special arose to lead me to conclude otherwise. A couple of issues nevertheless arose that I believe require diligence from ARPANSA to assure that adequate safety margins exist. One is the seismic capacity of the control-rod drives, for which the margins above the design basis need to be reviewed. The second is whether the design approach has been sufficiently attentive to possible earthquake-caused fires -- this latter issue has not been raised or treated anywhere as best I can tell.

Spent Fuel Conditioning Abroad - Safety Concerns

Some of the Forum presenters made quite a fuss about the contractual and political arrangements for RRR spent-fuel conditioning abroad. I know too little about this subject to comment, but one subject that arose is within my expertise and is worth mentioning. This is whether there are safety concerns about the spent-fuel-conditioning operations that would occur abroad (in France or possibly

in Argentina.) This was not raised as a major issue, but I believe it prudent for ARPANSA to learn enough about how safety is assured in both countries to be able to evaluate whether the safety of both the workers and the public will be adequately protected during those operations. I don't think that Australia should agree to shipping its spent fuel abroad if it were to result in important safety concerns even in another country. While I have my own confidence in the French and Argentine arrangements, this issue deserves some review.

The Egyptian Reactor's Safety Record

Allegations were raised during the Forum that the recently commissioned and INVAP-designed Egyptian reactor, some of whose design features are prototypical of the proposed RRR, has had operational problems. Such operational problems are not unusual during start-up. To me, this raises the question about whether any safety issues have arisen during the start-up period. This seems worthy of ARPANSA review in my opinion.

Operating HIFAR and RRR Together

During the Forum, the question arose as to whether HIFAR and the proposed RRR could be operated safely simultaneously, if such an eventuality were to occur. I believe that this is not a difficult question for ARPANSA to resolve.

Impacts of Potential Accidents on Property

Garry Smith of Sutherland Shire Council raised this issue, which I also raised in the submittal that I wrote for him. Specifically, there may be RRR accident scenarios that pose very small threats to public health but could cause enough offsite radiological contamination to be of concern to property. An established methodology exists for analyzing these contamination impacts, and its application is not difficult if only approximate results are sought. The results could help the public understand this important issue. I recommend that ANSTO should do such an analysis and that ARPANSA should review it.

Transportation Accidents

Accidents while transporting radioactive material, be it fresh fuel, spent fuel, or other radioactive waste, are always a major concern of some members of the public, and that concern was aired during the Forum. Greenpeace cited a recent report of theirs on this topic, that apparently reviewed a number of transportation incidents and accidents. The review of this and of other information on this subject is important so that ARPANSA can reach a finding as to whether these types of accidents pose a large public risk -- in my view, they almost certainly do not.

"Acceptable" vs. "Achievable" Safety Levels

During the Forum there was some concern and confusion about how ARPANSA has set (or should set) the safety levels to which the RRR would be held if licensed. According to general international practice, the regulator sets safety levels (and subsidiary criteria of various types) that a proposed design must meet, and then assures through review, analysis, and inspection that these levels "come true" in practice --- and with "margin" rather than "just barely." This seems to be ARPANSA's approach, and I agree with it completely. Specifically, safety criteria are not set at levels that a particular design is believed to be able to meet, but

rather at levels chosen so that, if met, the residual risks are acceptable in light of the benefits of the regulated activity. Because of the concern and confusion, I suggest that it might help the general public to understand and accept more fully the regulatory approach used by ARPANSA if an explanation of this issue, including the needed distinctions, were to be written down and disseminated widely. Such an explanation would be in the nature of expanding on the documents that ARPANSA has already issued that set down its safety philosophy and criteria (the Regulatory Assessment Principles, the Regulatory Assessment Criteria, and so on).

Safety Performance of the Radioactive-Waste Surface Store

During the Forum it was explained that the proposed radioactive-waste surface "store" is being designed for a 50-year operating life. During the question period, I suggested that it would be useful to know how much longer than 50 years the facility could operate safely (without being re-built) before its integrity would be challenged by aging phenomena in the engineered or natural barriers. It would also be helpful to understand fully the sorts of risks posed offsite from accidents at such a facility. I recommend that ARPANSA request these analyses from the facility's designers (the Department of Industry Tourism and Resources), that they be published, and that the analyses be reviewed by ARPANSA. Given the concern that perhaps the wastes at issue may end up on the surface for a very long time, it would be helpful for both ARPANSA and the public to have this type of information.