Response to Tentative Findings Report of the SA Nuclear Fuel Cycle Royal Commission

A joint submission from Friends of the Earth, Australia; the Australian Conservation Foundation; and the Conservation Council of SA.

18 March 2016

OVERVIEW

Our organisations have expressed deep reservations over the Royal Commission process to date, with particular concern over the Commission's pro-industry terms of reference and the unnecessarily complex nature of the Commission process.[1] Our organisations have a long-standing interest and experience with a range of nuclear industry issues in South Australia and beyond and were disappointed that our repeated requests to directly present and speak on this civil society experience was not accepted by the Commission. We are particularly concerned by this as it appears that key issues raised in our original detailed submission have been ignored in the Commission's tentative findings. We detail these omissions in these comments and urge that the Commission revisit these areas and address them in the final report.

The Tentative Findings report fails to demonstrate that a high-level nuclear waste facility is practical or economic for SA. The report downplays and ignores risks and uncritically presents incredibly optimistic forecasts of economic impacts.

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[1] 'A Critique of the South Australian Nuclear Fuel Cycle Royal Commission', December 2015, www.foe.org.au/sites/default/files/RC-critique-16Dec2015-final.pdf

1. URANIUM MINING

The Tentative Findings report states: "The lessons that have emerged from the state-owned uranium mine at Radium Hill, which closed in 1961, and the associated treatment works at Port Pirie have been incorporated into current regulatory frameworks".

The final report should recommend proper rehabilitation of both the Port Pirie site and Radium Hill.

The Tentative Findings report appears to be endorsing the current regulatory framework. Yet to give just one example of demonstrably inadequate regulation, as noted in our original submission (p.39), a Freedom of Information application revealed that the radiation plans for Olympic Dam were more than 15 years out of date. The final report of the Royal Commission should discuss that extraordinary lapse and make appropriate recommendations.

Likewise, the illegal dumping of radioactive ore samples by Marathon Resources, and the failure of the state government to detect the company's breaches, cannot be reconciled with the Royal Commission's apparent view that regulation is adequate.

The long-outdated radiation plan for Olympic Dam was revealed only after an FoI request. Likewise, the illegal dumping of radioactive materials in the Arkaroola Wilderness Sanctuary was not detected by state regulators. Those lapses would not have occurred if previous failures led to changes in the regulatory framework, nor have those two lapses led to any changes in the regulatory framework. Moreover numerous other lapses identified in our original submission are neither addressed or reflected in the Commission's tentative findings.

The Royal Commission appears to be leaning towards a recommendation to rationalise uranium mine approvals processes, perhaps by removing federal government oversight. The Tentative Findings report notes that the state/territory and federal approval process "has increased the anticipated costs of, and timeframes for, regulatory approval for a new uranium mine." It would be foolish to remove federal government involvement in the approvals process. As a specific case study, the Royal Commission should consider the Wiluna project in WA, where more stringent conditions imposed by the Commonwealth showed that there was a higher level of scrutiny by the federal government. A recommendation to remove federal government involvement would only be warranted if it was repeatedly shown that the conditions attached to approvals by the federal government were consistently very similar to or weaker than state/territory government approvals. That clearly is not the case. If the Royal Commission wants to argue the case, it should attempt to demonstrate that conditions imposed by the federal government (and the federal government alone) for uranium mines over the past decade are unnecessary and why the situation would be improved if none of those conditions were imposed.

There are too many basic factual errors in the Tentative Findings report and we are concerned that there will be an even larger number in the (longer) final report. For example the Tentative Findings report states that "Toro Energy is preparing to start operation of a new mine in Western Australia". In fact, Toro is unlikely to seek to open the mine unless and until the uranium price rises substantially. Moreover the company still requires a suite of mine approvals – tailings management, mine closure, transport licenses, export licenses, etc. The current conditional environmental approval explicitly states that the company cannot begin any preparatory works for the construction of a mine. The company does not have the financing to begin construction, and does not have the securities for the 100% bond that it is required to have. Nor does the company have the necessary Indigenous Land Use agreements.

A couple of other basic errors and oversights in the uranium section:

- It notes that Honeymoon is in care-and-maintenance but fails to note that Beverley is in the same situation.
- It states that "BHP Billiton's decision not to expand Olympic Dam is principally related to copper, the mine's main output". But BHP Billiton explicitly and prominently cited the low uranium price as one of the reasons for its decision to abandon the expansion. For good measure the final report of the Royal Commission should note that as well as abandoning the Olympic Dam expansion, BHP Billiton disbanded its uranium division and sold off the Yeelirrie deposit in WA for a small fraction of the nominal value of the resource.

2. FUEL LEASING

The comments in the Tentative Findings report on fuel leasing are extraordinarily speculative. The report envisages "a staged process to the development of any fuel leasing program" with an initial focus on storage and disposal of waste. It isn't at all clear how the storage and disposal of waste would facilitate entry into fuel cycle industries such as conversion, enrichment and fuel fabrication, nor does the Tentative Findings report explain the logic (if any) to the argument. The Tentative Findings report suggests that integration of fuel cycle industries "as part of fuel leasing might substantially alter the business model." Again, the logic isn't clear, and the argument overlooks the important point that the prospect of a substantially altered business model is precisely the reason why BHP Billiton has previously expressed strong opposition.

It is a major oversight that the Tentative Findings report fails to note that uranium companies – in particular BHP Billiton – have previously expressed clear opposition to any sort of fuel leasing arrangement. BHP Billiton's submission to Switkowski Review stated:[2]

"BHP Billiton believes that there is neither a commercial nor a non-proliferation case for it to become involved in front-end processing or for mandating the development of fuel leasing services in Australia. ... We do not believe that conversion and enrichment would be commercially viable in Australia. Nor do we believe any government imposed requirement to lease fuel, as distinct from acquiring uranium would be acceptable to its major customers, all of whom have alternative choices about where to acquire their U3O8."

"BHP Billiton has no intention to use the [Olympic Dam] mine as a basis to begin providing fuel leasing, conversion, enrichment, nuclear power or national or international waste disposal/storage services. ... [U]tilities typically acquire U3O8 and then contract directly with established conversion, enrichment and fuel fabrication service suppliers to meet their specific technical specifications for long periods and often spread supply agreements across a number of suppliers. Customers value this flexibility and choice. ... There is little evidence of a preference for purchasing a "bundled" supply of U3O8, conversion, enrichment and fuel fabrication services and no established market for fuel leasing."

"There is no evidence that a change to current Australian Government policies to facilitate domestic enrichment, fuel leasing and high level waste disposal would lead to significant economic opportunities or reduce proliferation risks in the foreseeable future. ... It would also put at risk our reputation with customers of being a reliable supplier of uranium concentrates and our ability to enter into the long term supply arrangements that underpin expansion of uranium mining. Noting that a nuclear fuel leasing industry − if permitted by the regulatory framework − is most unlikely to be commercially viable, BHP Billiton would strongly oppose any policies to artificially support the

[2] http://web.archive.org/web/20070830182528/www.pmc.gov.au/umpner/submissions/223_sub_umpner.pdf

premature development of such an industry by requiring BHP Billiton's customers to use Australian conversion, enrichment or fabrication services − or to quarantine reserves to underpin such a domestic capacity in the future. It would put customer relations and the investments those underpin at risk."

Note that BHP Billiton rejects the argument that there is a non-proliferation argument for fuel leasing. Yet the Tentative Findings report claims that fuel leasing has the potential to strengthen non-proliferation efforts. It is a huge stretch to argue a non-proliferation case when the specific proposal under discussion involves Australia, for two sets of reasons:
1. Australia has precious little fissile material but would be swimming in fissile material if the Royal Commission's proposals (fuel leasing / import of spent fuel) were pursued.
2. Australia relies on nuclear weapons (via the US alliance) and repeatedly undermines international nuclear non-proliferation initiatives (with topical examples being Australia's refusal to support a Nuclear Weapons Convention and advancing uranium sales to India against the clear recommendation of the Joint Standing Committee on Treaties).

Some comments in the Tentative Findings report need greater clarity, such as this statement: *"At its simplest, the concept involves a take-back option for fuel supplied to a utility operating a nuclear plant. Ownership of fuel is maintained by one entity. It removes for the utility the significant operational cost of storing and managing used fuel over the long term. It might also help secure contracts for the storage and disposal of used fuel."*

The Royal Commission appears to be envisioning a situation whereby an Australian government entity assumes ownership of the fuel. That being the case, the government could of course insist on the return of spent fuel, but it is circular to argue that would help to "secure contracts for the storage and disposal of used fuel." Moreover it would involve transfer of ownership of fresh fuel from uranium mining companies to the Australian government, which raises potential complications (e.g. price) and could prove to be one of the many reasons that uranium mining companies resist.

3. NUCLEAR POWER: SMALL MODULAR REACTORS

The Tentative Findings report states:
"If nuclear power were to be developed in South Australia, a proven design should be used that has been constructed elsewhere, preferably on multiple occasions, and should incorporate the most advanced active and passive safety features. This is likely to include consideration of small modular reactor (SMR) designs, but exclude for the foreseeable future fast reactors and other innovative designs because:
a. the generating capacities of SMRs would be attractive to integration in smaller markets, such as in South Australia and in off-grid applications. The commercial deployment of one or more light water SMR designs is likely overseas within the next decade. If successful this would provide credible evidence as to capability and costs. ..."

The above statements are inconsistent. On the one hand the Royal Commission states that if nuclear power is introduced it should be a proven design constructed elsewhere, "preferably on multiple occasions".

On the other hand, the commercial deployment of as few as one SMR "would provide credible evidence as to capability and costs". It simply wouldn't.

At best, SMRs will still be at the very early stages of the learning curve a decade from now. There will be little evidence regarding capability and costs. As Ron Cameron of UK Trade and Investment (and previously ANSTO) recently noted, cost increases for some large reactors have been

"disappointing to put it mildly. First of a kind (FOAK) reactors have many difficulties, SMRs will too."[3]

In all likelihood, SMRs will still be in limbo a decade from now, as they have been for decades and as they are today.

4. NUCLEAR POWER: GENERATION IV CONCEPTS

The Tentative Findings report correctly notes that reactors with "innovative designs are unlikely to be feasible or viable in South Australia in the foreseeable future."

The final report should note that there is a deeply troubled history with fast reactors. This history has largely been one of extremely expensive, underperforming and accident-prone reactors, as discussed in a detailed report by the International Panel on Fissile Materials[4] and in much other literature. The final report should note that most of the countries that invested in fast reactor technology have since abandoned those efforts.

5. NUCLEAR POWER: CHERNOBYL, FUKUSHIMA, AND LESSONS NOT LEARNED

CHERNOBYL

The comments in the Tentative Findings report on the health effects of Chernobyl are inaccurate and inadequate and require revision in the final report.

The Tentative Findings report is completely silent about the issue of long-term fatalities from radiation exposure from Chernobyl.

The Royal Commission purports to be basing its comments on UNSCEAR and WHO reports. In fact, UN reports in 2005 in 2005-06 – involving UNSCEAR, WHO, IAEA and other agencies – estimated up to 4,000 eventual deaths among the higher-exposed Chernobyl populations (emergency workers from 1986−1987, evacuees and residents of the most contaminated areas) and an additional 5,000 deaths among populations exposed to lower doses in Belarus, the Russian Federation and Ukraine.[5] The estimated death toll rises further when populations beyond those three countries are included. For example, a study by Cardis et al reported in the International Journal of Cancer estimates 16,000 deaths.[6]

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[3] www.nuclearconsult.com/blog/the-new-challenge-for-the-uks-nuclear-debate/

[4] International Panel on Fissile Materials, Feb 2010, 'Fast Breeder Reactor Programs: History and Status', www.ipfmlibrary.org/rr08.pdf
On the use of fast reactors in support of weapons production, see also Mycle Schneider, 2009, 'Fast Breeder Reactors in France', *Science and Global Security*, 17:36–53, www.princeton.edu/sgs/publications/sgs/archive/17-1-Schneider-FBR-France.pdf

[5] Chernobyl Forum, 2005, 'Chernobyl's Legacy: Health, Environmental and Socio-Economic Impacts', www.iaea.org/Publications/Booklets/Chernobyl/chernobyl.pdf
World Health Organization, 2006, www.who.int/mediacentre/news/releases/2006/pr20/en/index.html
www.who.int/ionizing_radiation/chernobyl/backgrounder/en/

[6] Cardis E, Krewski D, Boniol et al, 'Estimates of the Cancer Burden in Europe from Radioactive Fallout from the Chernobyl', International Journal of Cancer, Volume 119, Issue 6, pp.1224-1235, Published Online: 20 April 2006,
www.ncbi.nlm.nih.gov/pubmed/16628547
http://onlinelibrary.wiley.com/doi/10.1002/ijc.22037/pdf

If the Royal Commission wishes to argue that the uncertainties associated with estimates of fatalities based on collective doses are such that quantitative estimates of the death toll are inappropriate:

- Then the Royal Commission should justify that position.
- More importantly, if the Royal Commission adopts that position it must acknowledge an unknown and uncertain long-term cancer death toll instead of simply ignoring the issue.
- The Royal Commission should further note that quantitative estimates based on the linear no-threshold may overestimate **or underestimate** the true death toll. The US BEIR report[7] states that "combined analyses are compatible with a range of possibilities, from a reduction of risk at low doses to risks twice those upon which current radiation protection recommendations are based." The BEIR report also states: "The committee recognizes that its risk estimates become more uncertain when applied to very low doses. Departures from a linear model at low doses, however, could either increase or decrease the risk per unit dose."

British radiation biologist Dr Ian Fairlie has recently released the most up-to-date report on the impacts of the Chernobyl disaster.[8] Dr Fairlie summarises the main impacts:

- 5 million people in Belarus, Ukraine and Russia still live in highly contaminated areas, and 400 million people in less contaminated areas.
- 37% of Chernobyl's fallout deposited on western Europe; 42% of western Europe contaminated.
- Initially, about 116,000 people were evacuated, and later an additional 230,000 people were resettled.
- 40,000 fatal cancers predicted across Europe (based on an estimated collective dose of 400,000 person-Sieverts and a linear no-threshold derived risk estimate of 0.1 fatal cancers per person-Sievert).
- 6,000 thyroid cancer cases to date, 16,000 more expected.
- Increased radiogenic thyroid cancers now seen in Austria: 8–41% of increased thyroid cancer cases after 1990 in Austria may be due to Chernobyl.
- Increased incidences of leukemia well established among the clean-up workers in Ukraine and Russia with very high risk factors. Slightly lower leukemia risks were observed among residents of seriously contaminated areas in Ukraine and Belarus. Indications of increased leukemia risks among infants have been observed in Slovakia, Germany, Greece, Italy and Belarus, but research that would clarify the matter has been stalled mainly by lack of funding.
- Increases in solid cancers were observed among clean-up workers in Belarus and Ukraine but their relative risks (20% to 50%) were considerably lower than the 700% increases observed for thyroid cancer, and the 200% to 500% increases observed for leukemia.
- Several new studies have confirmed increased risks of cardiovascular disease and stroke after Chernobyl. It is recommended that further studies be funded and carried out on radiogenic cardiovascular diseases. As current radiation dose limits around the world are based on cancer risks alone, it is recommended that they should be tightened to take into account cardiovascular disease and stroke risks as well.
- A recent very large study observed statistically significant increases in nervous system birth defects in highly contaminated areas in Russia, similar to the elevated rates of such birth defects

[7] US Committee on the Biological Effects of Ionising Radiation, US National Academy of Sciences, 2006, 'Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2', www.nap.edu/books/030909156X/html

[8] Ian Fairlie, March 2016, 'TORCH-2016: An independent scientific evaluation of the health-related effects of the Chernobyl nuclear disaster',
www.global2000.at/en/node/4417
www.global2000.at/sites/global/files/TORCH%20-%20The%20other%20Report%20of%20Chernobyl.pdf

observed in highly contaminated areas in Ukraine. The International Agency for Research on Cancer should be funded to carry out a comprehensive study of birth defects, particularly nervous system defects and Down Syndrome after Chernobyl.

FUKUSHIMA

As with Chernobyl, the Royal Commission purports to be basing its comments about Fukushima on UNSCEAR and WHO reports, but it fails to do so.

The Tentative Findings report states that apart from thyroid cancer, "an increase in other types of cancer is not expected." But the WHO report states that for people in the most contaminated areas in Fukushima Prefecture, the estimated increased risk for all solid cancers will be around 4% in females exposed as infants; a 6% increased risk of breast cancer for females exposed as infants; a 7% increased risk of leukaemia for males exposed as infants; and for thyroid cancer among females exposed as infants, an increased risk of up to 70% (from a 0.75% lifetime risk up to 1.25%).[9]

It is unacceptable that the Royal Commission has ignored the WHO report. It was referenced in the joint submission from Friends of the Earth, the Australian Conservation Foundation and the Conservation Council of SA. The WHO report is also referenced in the critique of the Royal Commission produced by the same organisations.[10]

The Royal Commission also ignores indirect deaths. A September 2012 editorial in *Japan Times* noted that 1632 deaths occurred during or after evacuation from the triple-disaster; and nearly half (160,000) of the 343,000 evacuees were dislocated specifically because of the nuclear disaster.[11] A January 2013 article in *The Lancet* notes that "the fact that 47 per cent of disaster-related deaths were recognised in Fukushima prefecture alone indicates that the earthquake-triggered nuclear crisis at the Fukushima power plant caused extreme hardship for local residents."[12]

One aspect of the broader issue of indirect deaths concerns suicides. The Fukushima-related suicide toll continues to rise, with 19 such suicides in Fukushima Prefecture from Jan–Nov 2015. Police determine if a suicide was related to the Fukushima disaster and subsequent evacuation after talking to bereaved family members. As of February 2016, a total of 154 suicides have been linked to the Fukushima disaster in the three prefectures most heavily hit by the nuclear disaster – Fukushima, Miyagi and Iwate.[18]

LESSON NOT LEARNED

The Tentative Findings report states that Chernobyl, Fukushima and Three Mile Island have been "thoroughly and credibly investigated to determine both causes and lessons to be learned." It further states: "The lessons learned from the design, siting and cultural factors that contributed to these accidents have been applied to new developments."

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[9] WHO, 28 Feb 2013, 'Global report on Fukushima nuclear accident details health risks', www.who.int/mediacentre/news/releases/2013/fukushima_report_20130228/en/

[10] 'A Critique of the South Australian Nuclear Fuel Cycle Royal Commission', December 2015, www.foe.org.au/sites/default/files/RC-critique-16Dec2015-final.pdf

[11] 'Slow road to reconstruction', 19 Sept 2012, *The Japan Times*, www.japantimes.co.jp/?post_type=opinion&p=8338

[12] Ichiseki, Hajime, 19 Jan 2013, 'Features of disaster-related deaths after the Great East Japan Earthquake', The Lancet, Vol.381, Issue 9862, www.thelancet.com/journals/lancet/article/PIIS0140-6736%2813%2960091-4/fulltext

If lessons are learned, why do accidents keep happening? Mismanagement and inadequate regulation were at the heart of the Chernobyl disaster. Clearly that lesson was not learned in Fukushima.

The Tentative Findings report fails to note that the patterns that led to the Fukushima disaster are re-emerging in Japan.[13] In other words the 'nuclear village' is back in control. Junko Edahiro, chief executive of Japan for Sustainability and one of the people removed from an energy policy advisory committee by the Abe government, noted in November 2014:
"Now what we have is a situation where government officials and committees are back to doing their jobs as if the March 2011 disasters had never occurred. They have resumed what they had been doing for 30 or 40 years, focusing on nuclear power ... In Japan we have what some people refer to as a 'nuclear village': a group of government officials, industries, and academia notorious for being strongly pro-nuclear. There has been little change in this group, and the regulatory committee to oversee nuclear policies and operations is currently headed by a well-known nuclear proponent."[14]

The re-emergence of the nuclear village in Japan continues a long pattern. A U.S. Nuclear Regulatory Commission report said of the fatal 1999 criticality accident at Tokai-mura: "The NRC staff agrees with the Government of Japan's conclusion that the general root causes of the accident were: (1) inadequate regulatory oversight; (2) lack of an appropriate safety culture; and (3) inadequate worker training and qualification."[15] Lessons clearly were not learned from the Tokai-mura accident.

The same patterns played out in the 2000s. The Tokyo-based Citizens Nuclear Information Center (CNIC) documented this sordid history in detail. Here is a brief excerpt from a 2007 CNIC article titled *Nuclear State and Industry: Bottomless Depths of Corruption*.[16]

> *"A web of falsification and deception in Japan's electric power industry was uncovered late in 2006. On 30 March 2007, all 12 power companies submitted reports to the government. Their reports, covering nuclear, fossil fuel and hydroelectric power stations, identified a colossal 10,646 irregularities. Of those, 455 cases involved nuclear power plants, including 230 at Tokyo Electric Power Company (TEPCO) and 123 at Chubu Electric.*
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> *"On April 6th, power companies submitted reports to the Nuclear Industrial and Safety Agency (NISA) explaining how they propose to prevent such problems arising in future. NISA responded on April 20th by announcing administrative proceedings against four companies in relation to seven reactors. The penalty imposed is that the companies must alter their safety provisions. NISA has not demanded that reactors be shut down, nor has it suspended any licenses. With such lenient treatment as this, one can hardly expect that such problems will not arise in future.*
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> *"A previous TEPCO scandal came to light in August 2002 when a whistleblower revealed that the company had falsified inspection records and concealed problems at its nuclear*

[13] 31 March 2015, 'Atomic zombies: Japan's 'nuclear village' is back in control', Climate Spectator, www.businessspectator.com.au/article/2015/3/31/policy-politics/atomic-zombies-japans-nuclear-village-back-control

[14] Junko Edahiro, Nov 2014, 'Toward a Sustainable Japan: Fukushima Accidents Show Japan's Challenges', JFS Newsletter No.147, www.japanfs.org/en/news/archives/news_id035110.html

[15] U.S. NRC, 'NRC Review of the Tokai-mura Criticality Accident', www.nrc.gov/reading-rm/doc-collections/commission/secys/2000/secy2000-0085/attachment1.pdf

[16] Yukio Yamaguchi, 11 May 2007, 'Nuclear State and Industry: Bottomless Depths of Corruption', www.cnic.jp/english/?p=1104

power plants. Thereafter, similar problems were discovered at plants belonging to other power companies. On that occasion TEPCO was forced to close down all 17 of its nuclear reactors. Four directors accepted responsibility by resigning and the company promised to work to recover public trust. This time there is little evidence of contrition.

"During the 2002 scandal, the discovery of corruption in the government's periodic inspections showed the hollowness of Japan's nuclear safety system. This time the Minister for Economy Trade and Industry directed that a thorough investigation be carried out to "uncover the truth with no concealment". However, by rights, these problems should have been identified at the time of the 2002 scandal. The root of the problem is that the government, the power companies and the plant makers are all in bed together. What we are seeing once again is the true nature of Japan's nuclear club. ...

"Can we be sure that there are no more incidents to be uncovered? Certainly not. NISA admitted as much during a meeting with politicians and citizens groups on April 13th. It seems that the depths of corruption in Japan's nuclear industry are unfathomable. ...

"It has become clear that we cannot trust the regulator any more than the companies, but even if it wanted to, NISA does not have the ability to properly check what is going on. When representatives of CNIC and other NGOs visited NISA on April 13th, NISA showed not the slightest sign of remorse. The fact that it is located within the Ministry of Economy Trade and Industry, which also has the role of promoting nuclear power, does not help of course."

Clearly lessons were not learned from the scandals and accidents in the 2000s ... hence the Fukushima disaster.

Here is a list of some other articles documenting grossly inadequate safety standards in Japan, grossly inadequate regulation and a failure to learn lessons:

- 'TEPCO's Damage Cover-up and Data Falsification', Nov/Dec 2002, www.cnic.jp/english/newsletter/nit92/nit92articles/nit92coverupdata.html
- 'Revelation of Endless N-damage Cover-ups', Nov/Dec 2002, www.cnic.jp/english/newsletter/nit92/nit92articles/nit92coverup.html
- 'All 17 of TEPCO's units shut down', March/April 2003, www.cnic.jp/english/newsletter/nit94/nit94articles/nit94tepco.html
- 'Significant Incidents at Nuclear Power Plants and Nuclear Fuel Facilities in 2002', May/June 2003, www.cnic.jp/english/newsletter/nit95/nit95articles/nit95significant.html
- 'Looking Back Over a Year of TEPCO's Cover-up', Sept/Oct 2003, www.cnic.jp/english/newsletter/nit97/nit97articles/nit97tepco.html
- 'Revelations of sloppy management at nuclear power stations', March/April 2004, www.cnic.jp/english/newsletter/nit99/nit99articles/nit99sloppy.html
- 'Five Killed in Mihama-3 Accident', Sept/Oct 2004, www.cnic.jp/english/newsletter/nit102/nit102articles/nit102mihama.html
- 'Pattern of data falsification', Jan/Feb 2007, www.cnic.jp/english/newsletter/nit116/nit116articles/nw116.html#datafals
- '"Not Again": Yet Another TEPCO Scandal', March/April 2007, www.cnic.jp/english/newsletter/nit117/nit117articles/nit117tepco.html
- 'Shika-1 Uncontrolled Criticality Incident Cover-up', March/April 2007, www.cnic.jp/english/newsletter/nit117/nit117articles/nit117shikacrit.html

In its own small but important way, the Royal Commission could help to prevent the next Chernobyl or Fukushima by highlighting emerging / recurring problems in Japan's nuclear industry (and problems elsewhere – profoundly inadequate liability arrangements[17] is one important example). Further the Commission could and should make a measured case to the long overdue review of Australia's uranium sector recommended in the UN system wide study of September 2011. It is deeply disappointing that the Royal Commission instead appears to have chosen to promote the views of the nuclear industry. Our organisations urge the Commission to revisit this area in its final report.

The industry's failure to learn lessons is even acknowledged in industry literature. The OECD's Nuclear Energy Agency notes that lessons may be learned but too often they are subsequently forgotten, or they are learned but by the wrong people, or they are learned but not acted upon. The Nuclear Energy Agency says the pattern of the same type of accident recurring time and time again at different nuclear plants needs to be "much improved".

The United States provides another example. The Union of Concerned Scientists (UCS) has released a report on the failure of the U.S. nuclear power industry to adequately respond to safety flaws in the five years since Fukushima, and the failures of the Nuclear Regulatory Commission (NRC).[18] After Fukushima, the NRC set up a task force to analyse what happened at Fukushima and assess how to make U.S. reactors safer. In July 2011, the task force offered a dozen recommendations to help safeguard U.S. nuclear plants in the event of a Fukushima-scale accident. Unfortunately, the NRC has since rejected or significantly weakened many of those recommendations and has yet to fully implement the reforms it did adopt. The UCS report also finds that the NRC abdicated its responsibility as the nation's nuclear watchdog by allowing the industry to routinely rely on voluntary guidelines, which are, by their very nature, unenforceable. Among many other problems, the NRC decided to continue to allow plant owners to develop their own voluntary plans for managing a core-melt accident, rejecting a task force recommendation to require them to do so. If plans are voluntary, the NRC has no authority to review them or issue citations when they are deficient.

6. RADIATION RISKS

The Tentative Findings report states that: "at low levels (in the range of ordinary exposures from natural sources) there is ongoing scientific debate on the extent of any health risk that radiation exposure might create."

Strictly speaking that is true but it ignores the point that there is a consensus or near-consensus view amongst qualified scientists that there is no threshold below which radiation is harmless. For example, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) states in a 2010 report that "the current balance of available evidence tends to favour a non-threshold response for the mutational component of radiation-associated cancer induction at low doses and low dose rates."[19]

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[17] Antony Froggatt, Dr David McNeill, Prof Stephen Thomas and Dr Rianne Teule, February 2013, 'Fukushima Fallout: Nuclear business makes people pay and suffer', www.greenpeace.org/international/Global/international/publications/nuclear/2013/FukushimaFallout.pdf

[18] Union of Concerned Scientists, March 2016, 'Preventing an American Fukushima: Limited Progress Five Years after Japan's Nuclear Power Plant Disaster', www.ucsusa.org/sites/default/files/attach/2016/03/Preventing-American-Fukushima-full-report.pdf

[19] UNSCEAR, 2010, Report of the United Nations Scientific Committee on the Effects of Atomic Radiation on the Effects of Atomic Radiation 2010', www.unscear.org/docs/reports/2010/UNSCEAR_2010_Report_M.pdf

Likewise, the 2006 report of the US National Academy of Sciences' Committee on the Biological Effects of Ionising Radiation (BEIR) states that "the risk of cancer proceeds in a linear fashion at lower doses without a threshold and … the smallest dose has the potential to cause a small increase in risk to humans."[20]

Likewise, a report in the *Proceedings of the National Academy of Sciences* states: "Given that it is supported by experimentally grounded, quantifiable, biophysical arguments, a linear extrapolation of cancer risks from intermediate to very low doses currently appears to be the most appropriate methodology."[21]

Seeking to seed doubt, fracture consensus and promote an artificial sense of 'debate' in relation to widely held scientific understandings is a tactic well known and often used by the tobacco, asbestos and nuclear lobbies. It is also the standard tool of climate change deniers. The Royal Commission should be wary of replicating this model in relation to the linear, no-threshold approach to radiation.

7. WEAPONS PROLIFERATION

"SOUND" NON-PROLIFERATION CREDENTIALS?

The Tentative Findings report asserts that Australia has "sound" non-proliferation credentials. How does the Royal Commission arrive at that conclusion when Australia relies on the US nuclear weapons 'deterrent', provides practical and political support to the US nuclear weapons program, and consistently undermines non-proliferation initiatives?

Given Australia's long-standing reliance on nuclear weapons, and ongoing practical and political support for nuclear weapons, other countries have every reason to be concerned about proposals which would move Australia close to a nuclear weapons capability.

Former IAEA Director-General Mohamed El Baradei noted:
"Why, some ask, should the nuclear-weapon States be trusted, but not others − and who is qualified to make that judgment? Why, others ask, is it okay for some to live under a nuclear threat, but not others, who continue to be protected by a 'nuclear umbrella'?"[22]

Here is some of the relevant literature:

> *Tim Wright, 11 February 2016, 'In Nuclear Diplomacy, Double Standards Abound', https://newmatilda.com/2016/02/11/in-nuclear-diplomacy-double-standards-abound/*
>
> *Richard Lennane, 7 Jan 2016, 'North Korea hydrogen bomb: Australia has a dangerous double standard when it comes to nuclear weapons', www.theage.com.au/comment/north-*

[20] US Committee on the Biological Effects of Ionising Radiation, US National Academy of Sciences, 2006, 'Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2', www.nap.edu/books/030909156X/html

[21] David Brenner et al., 2003, 'Cancer risks attributable to low doses of ionizing radiation: Assessing what we really know', Proceedings of the National Academy of Sciences, November 25, 2003, vol.100, no.24, pp.13761–13766, www.ncbi.nlm.nih.gov/pubmed/14610281

[22] http://web.archive.org/web/20070829214153/http://www.wagingpeace.org/articles/2007/05/24_ElBaradei_Preventing_Nuclear_Catastrophe.htm

korea-hydrogen-bomb-australia-has-a-dangerous-double-standard-when-it-comes-to-nuclear-weapons-20160106-gm0sp4.html
Richard Lennane, a former United Nations disarmament official and Australian diplomat, writes:
"Like North Korea, Australia believes that nuclear weapons really do make it safer. Of course, Australia claims that it supports nuclear disarmament and is working for a world free of nuclear weapons. But our actions say something different: Australia relies on extended nuclear deterrence for its security, has no plans to change that, and has been actively opposing and resisting international steps to stigmatise and prohibit nuclear weapons on humanitarian grounds. ...
"Double standards and hypocrisy make a poor basis for effective foreign policy. Every time Australia defends the legitimate role of nuclear weapons for itself and its allies, it defends them for everyone. By clinging to nuclear deterrence as a key element of national defence, and resisting steps to reduce the role and legitimacy of nuclear weapons, Australia and its allies are inciting proliferation and giving moral and legal cover to the likes of North Korea. Australians should be appalled that we are in fact pursuing the same irresponsible and dangerous defence strategy that our Foreign Minister has rightly condemned North Korea for adopting. ...
"Australia's continued reliance on nuclear deterrence for security, and its insistence that nuclear weapons are not inherently illegitimate, only encourages other countries to acquire them and challenges the Nuclear Non-proliferation Treaty.
"The Australian government should drop its opposition to international efforts to prohibit nuclear weapons on humanitarian grounds, take practical steps to begin reducing the role of nuclear weapons in its defence strategy, and encourage its allies to do the same."

Richard Lennane, 10 April 2014, 'Australian policy on nuclear weapons hopelessly conflicted', www.smh.com.au/comment/australian-policy-on-nuclear-weapons-hopelessly-conflicted-20140410-zqt9l.html
Lennane writes:
"Calls for a new treaty to ban nuclear weapons have further exposed the contradictions in Australia's policy. There is no legal reason Australia could not join such a treaty tomorrow: Australia has no nuclear weapons. As a member of the Nuclear Non-proliferation Treaty (NPT) it has sworn off them.
"The official response, however, has been to oppose such a ban because it would not "guarantee" nuclear disarmament. This is a ludicrous excuse, given that none of the approaches Australia and the NPDI advocate will "guarantee" disarmament either (in fact most of them are hopelessly bogged down).
"That a polished performer like Bishop would field such a flimsy rationalisation only shows how bare the intellectual cupboard at the Foreign Ministry is. They can't find a better argument, because there isn't one.
"Despite the increasing visibility of its inherently contradictory policy, the government blithely continues to seek a high profile on nuclear disarmament.
"The people of Hiroshima will surely welcome Bishop's earnest undertakings to address the humanitarian impact of nuclear weapons and pursue nuclear disarmament. They will be less impressed by her extraordinary statement that "the horrendous humanitarian consequences of nuclear weapons are precisely why deterrence has worked" – in other words, that Australia depends for its security on the very humanitarian consequences it claims to be working to avoid."

Richard Lennane, 1 November 2014, 'Ban the bomb?: An Australian response', Bulletin of the Atomic Scientists, Nov/Dec 2014, http://thebulletin.org/2014/november/ban-bomb-australian-response7788

Ben Doherty, 16 September, 'Australia resists nuclear disarmament push because it relies on US deterrent', www.theguardian.com/world/2015/sep/16/australia-isolated-in-its-hesitation-to-sign-treaty-banning-nuclear-weapons
Doherty writes:
"Prospects for nuclear disarmament are "bleak" under the current non-proliferation treaty, Australian diplomats have conceded in cables back to Canberra, but the country will resist growing global support for a new treaty banning nuclear weapons because of a dependence on the nuclear deterrent capability of the US.
"A tranche of internal government emails from within the Department of Foreign Affairs and Trade reveals Australia's opposition to a 116-nation push to ban nuclear weapons is leaving it increasingly isolated globally, and especially among anti-nuclear neighbours."

Ben Doherty, 18 September 2015, 'Australia defends opposition to global push for nuclear weapons ban', www.theguardian.com/world/2015/sep/18/australia-defends-its-opposition-to-global-nuclear-weapon-ban

ICAN Australia, 16 September, 2015, 'FOI documents reveal Australia is worried' about growing momentum' towards global ban on nuclear weapons'.
ICAN report:
www.icanw.org/campaign-news/foi-documents-reveal-australia-is-worried-about-growing-momentum-towards-nuclear-ban/
FOI documents:
www.icanw.org/wp-content/uploads/2015/09/FOI-DFAT-Sept2015.pdf

STRENGTHENING SAFEGUARDS?

The Tentative Findings report asserts that Australia's allegedly "sound" non-proliferation credentials derives from Australia's "active involvement in strengthening the international safeguards system and its demonstrated approach to managing non proliferation and security risks in undertaking nuclear fuel cycle activities."

Those claims lack currency and accuracy. Perhaps there was a time when Australia worked to strengthen the international safeguards system through international treaty and other mechanisms, but sadly this is long past.

The Royal Commission's assertion that Australia is actively involved in strengthening safeguards is not only false, it has dangerous real-world consequences by providing a fig-leaf of legitimacy for the reckless policies of successive governments, particularly over the past decade.

Australia's willingness to sell uranium to nuclear weapons states that are clearly not compliant with their NPT obligations discourages disarmament and encourages nuclear proliferation.

Australia's willingness to sell uranium to countries refusing to sign and/or ratify the Comprehensive Test Ban Treaty undermines the CTBT.

Australia's willingness to sell uranium to countries that have not signed/ratified the Nuclear Non-Proliferation Treaty undermines the NPT.

Australia's willingness to sell uranium to countries with a history of covert nuclear weapons research (e.g. South Korea and Taiwan) undermines nuclear non-proliferation.

Australia takes credit for requiring prior consent before Australian nuclear material is enriched beyond 20% uranium-235 or reprocessed. But Australia has never once invoked those rights – even when the result has been plutonium stockpiling. How does that amount to "strengthening safeguards"?

Australia also allows the processing of nuclear materials in facilities which are not covered by IAEA safeguards. For example Australia agreed to the processing of Australian uranium in unsafeguarded enrichment plants in Russia and the recommendation was readily accepted by the federal government. Clearly that is a **weakening** of safeguards that sets an adverse precedent.

How exactly is Australia "strengthening safeguards" by selling uranium to Russia when it is an undisputed fact that IAEA safeguards inspections in Russia are very nearly non-existent? We pose that not as a rhetorical question given that Russian sales are currently suspended, but rather one that the Royal Commission needs to answer.

The Joint Standing Committee on Treaties rejected[23] the agreement to sell uranium to Russia when it learnt that IAEA safeguards inspections in Russia are nearly non-existent. Among other recommendations the JSCT said it is "essential that actual physical inspection by the IAEA occurs at any Russian sites that may handle" Australian uranium and that uranium exports "should be contingent upon such inspections being carried out." The major parties in Canberra rejected the recommendation − they were prepared to allow uranium sales to Russia despite being well aware that IAEA safeguards inspections are very nearly non-existent. Again we ask: how does that amount to "strengthening safeguards"?

Strengthening safeguards by selling uranium to a nuclear weapons state outside the NPT that is actively expanding its weapons arsenal, its fissile material production capabilities, its weapons delivery capabilities and refuses to sign the CTBT?

The Australian government has further **weakened** the safeguards system by pursuing a nuclear cooperation agreement with India that weakens safeguards standards in many respects. The agreement has been strongly opposed by, among others, a former Director-General of the Australian Safeguards and Non-Proliferation Office (John Carlson), a former Chair of the Board of Governors of the International Atomic Energy Agency (Ronald Walker), a former Assistant Director of the US Arms Control and Disarmament Agency (Prof. Lawrence Scheinman) and an Australian nuclear arms control expert (Crispin Rovere).[24]

John Carlson, who headed Australia's safeguards office for 21 years and is a member of the Royal Commission's Expert Advisory Panel, argues that the agreement with India "represents a serious weakening of Australia's ... safeguards conditions" and that weaknesses in the agreement "mean Australian material could be used in support of India's nuclear weapon program."[25]

Mr Carlson told the Joint Standing Committee on Treaties:
"So my conclusion, very reluctantly, is that this proposed treaty is not fit for ratification as it stands. It is bad for our security, bad for our uranium miners, bad for our bilateral relations with third countries and bad for the path we would like to see India take."

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[23] www.aph.gov.au/Parliamentary_Business/Committees/House_of_Representatives_Committees?url=/jsct/14may2008/report1/fullreport.pdf

[24] See their submissions to the JSCT: www.aph.gov.au/Parliamentary_Business/Committees/Joint/Treaties/28_October_2014/Submissions

[25] www.aph.gov.au/DocumentStore.ashx?id=35fb7f72-904c-4d44-b387-f34e4afb77f9&subId=301365

The Joint Standing Committee on Treaties recommended against uranium sales to India unless numerous conditions were met. The government responded shortly thereafter with a superficial response rejecting of all the Committee's recommendations.

Now that the uranium agreement with India has been approved, there will be sustained pressure for Australia to apply equally inadequate standards to other countries. As John Carlson noted in a submission to JSCT: "If the Government does compromise Australia's safeguards conditions, inevitably this will lead to other agreement partners asking for similar treatment."[26]

Moreover, other nuclear and uranium exporting countries will follow Australia's lead and weaken their safeguards requirements. This disturbing and cascading retreat from responsibility would further compromise non-proliferation objectives and mechanisms.

The agreement with India weakens safeguards and nuclear non-proliferation and disarmament initiatives in several other ways:

- Selling uranium to nuclear weapons states discourages disarmament and encourages nuclear proliferation.
- Selling uranium to countries refusing to sign the Comprehensive Test Ban Treaty (as is the case with India) undermines the CTBT.
- Selling uranium to countries that have not signed the Nuclear Non-Proliferation Treaty (as is the case with India) undermines the NPT.

Further to the last point, Australia could have made uranium sales to India conditional on concrete initiatives such as India signing and ratifying the CTBT, or a verified cessation of fissile material production for weapons. No such creative diplomacy was even attempted, much less realised.

The Royal Commission's interim findings and discussion is seriously flawed by its failure to address these issues and we urge that this deficiency is not replicated in the final report.

SENSITIVE NUCLEAR TECHNOLOGIES

The Tentative Findings report states that "the potential for proliferation and security risks from nuclear fuel cycle activities is greatest for enrichment or reprocessing because those facilities can produce highly enriched uranium or separated plutonium capable of use in nuclear weapons."

It goes on to assert that the risks are "lower" for uranium mining despite the fact that uranium is the feedstock for all nuclear weapons. Having offered that disingenuous argument, the Royal Commission might as well offer the equally disingenuous argument that enrichment plants are of no proliferation risk since they are perfectly harmless in the absence of a source of uranium.

The Tentative Findings report asserts that the risks are "lower" for spent nuclear fuel because it "would require the further step of reprocessing before the plutonium could be utilised in a weapon". Having offered that disingenuous argument, the Royal Commission might as well offer the equally disingenuous argument that reprocessing plants are perfectly harmless in the absence of spent nuclear fuel to process.

The Royal Commission seems likely to recommend a plan to import 138,000 tonnes of spent fuel. That would include 1,380 tonnes of plutonium (1% of spent fuel). Approximately 10 kgs of 'reactor grade' plutonium will suffice for one Nagasaki-equivalent nuclear weapon. So the Royal

[26] www.aph.gov.au/DocumentStore.ashx?id=79a1a29e-5691-4299-8923-06e633780d4b&subId=301365

Commission seems likely to recommend a plan that would involve Australia importing nuclear waste containing enough plutonium to build 138,000 nuclear weapons. Clearly proliferation issues and sensitivities are involved, notwithstanding the Royal Commission's attempt to claim otherwise, and those concerns and sensitivities are heightened by Australia's reliance on and active support for nuclear weapons.

The Tentative Findings report asserts that the risks are "lower" for nuclear power plants because the plutonium they produce "is not usable in nuclear weapons without reprocessing the fuel." Having offered that disingenuous argument, the Royal Commission might as well offer the equally disingenuous argument reprocessing plants are perfectly harmless in the absence of a reactor to irradiate fertile nuclear materials.

8. NUCLEAR SECURITY / INSECURITY

The Royal Commission asserts that although nuclear security risks are "manageable and well-managed". As with much else in the Tentative Findings report, not a shred of evidence is provided to justify the assertion.

Repeated incidents and threats to ANSTO's Lucas Heights nuclear facility are alarming in and of themselves, and an expansion of Australia's role in the nuclear industry would pose far greater security risks (especially given the nature of the materials envisaged in expansion plans).

Incidents at ANSTO's Lucas Heights site in southern Sydney include the following:[27]

- 1983: nine sticks of gelignite, 25 kg of ammonium nitrate (usable in explosives), three detonators and an igniter were found in an electrical substation inside the boundary fence. A detonator was set off but did not detonate the main explosives. Two people were charged.
- 1984: a threat was made to fly an aircraft packed with explosives into the HIFAR reactor; one person was found guilty of public mischief.
- 1985: after vandalism of a pipe, radioactive liquid drained into Woronora river, and this incident was not reported for 10 days. In 1986 an act of vandalism resulted in damage to the sampling pit on the effluent pipeline.
- 2000: in the lead-up to the Sydney Olympics, New Zealand detectives foiled a plot to attack the Lucas Heights reactor by Afghan sympathisers of Osama bin Laden.
- 9 October 2001: NSW and Federal police conducted a search following a bomb threat directed at ANSTO.
- December 2001: Greenpeace activists easily breach security at the front gate and the back fence of Lucas Heights, some activists scale the reactor while another breaches the 'secure air space' in a paraglider.
- October 2003: French terror suspect Willy Brigitte deported from Australia and held on suspicion of terrorism in France; alleged to have been planning to attack the reactor and to have passed on bomb-making skills to two Australians.
- November 2005: multiple coordinated arrests of terrorist suspects in Sydney and Melbourne. Court documents reveal the Lucas Heights reactor was a potential target. Three of the eight alleged members of the Sydney terror cell had previously been caught near the reactor facility by police in December 2004, each alleged to have given different versions of what they had been doing.
- November 2005: a reporter and photographer were able to park a one-tonne van for more than half an hour outside the Lucas Heights back gate, protected by a simple padlock able to be cut

[27] Tilman Ruff, 2006, 'Nuclear Terrorism', EnergyScience Coalition Briefing Paper #10, www.energyscience.org.au/FS10%20Nuclear%20Terrorism.pdf

with bolt-cutters, 800 m from the reactor. *The Australian* reported: "The back door to one of the nation's prime terrorist targets is protected by a cheap padlock and a stern warning against trespassing or blocking the driveway."[28]

- 2007: A man facing terrorism charges had purchased five rocket launchers allegedly stolen from the army. According to a witness statement, the accused purchaser said "I am going to blow up the nuclear place", an apparent reference to Lucas Heights.[29]

9. IMPACTS ON OTHER SECTORS

The Tentative Findings report asserts that there "is no compelling evidence from any international experience that the development of nuclear facilities in South Australia would adversely affect other economic sectors, provided those facilities are operated safely and securely."

There's no need to go overseas to see impacts on other sectors. Examples abound in Australia. For example:

- Contamination around the former uranium mine at Rum Jungle restricts potential uses of the land and has sometimes restricted use of the Rum Jungle South Recreation Reserve. Despite some $20 million of rehabilitation works, the site remains a major source of extreme acid and metalliferous drainage to the Finniss River, as well as other ongoing problems including erosion, weed invasion, site security and so on. In November 2010, the Rum Jungle South Recreation Reserve was closed due to low-level radiation in the area − the Department of Resources advised the local council to shut down the reserve as a precautionary measure. Presumably fishing of the Finniss River has been restricted because of contamination from mine toxins.
- A contaminated site near Kalgoorlie is unavailable for alternative uses − and poses an ongoing security / public health problem. In 2012, damage to a security gate allowed children to enter the contaminated site, where more than 5,000 tonnes of tailings from the Yeelirrie uranium deposit were buried in the 1980s. BHP Billiton said it would improve security.
- The legacy of multiple uranium mines and two mills in the Upper South Alligator Valley in the Northern Territory has likely restricted tourism and other potential uses of the land.
- The controversial Hunters Hill site in Sydney has been disruptive for local residents and one wonders what impact the saga has had on local property prices.
- The Port Pirie uranium processing site is off limits for recreational and other uses. Six uranium tailings dams and a rare earth extraction dam cover approximately 26 hectares.[30] A later plan for a rare earths mine was abandoned and the decision to abandon the mine proposal is likely to have been influenced by residual contamination from uranium processing (contamination certainly motivated community opposition to the proposed mine).
- BHP Billiton's water take from the Great Artesian Basin for the Olympic Dam mine (the company is licensed to take up to 42 million litres daily) has impacted the Mound Springs (see the references listed in section 1.10 of our original submission) and made them less attractive as a tourist drawcard.
- BHP Billiton's water take also competes with local pastoral operations. In August 2014 *The Australian* reported that pastoralist Shane Oldfield from Clayton Station blames BHP Billiton

[28] Jonathan Porter, 19 Nov 2005, 'Nuclear site left exposed at the back door', *The Australian*.

[29] Sally Neighbour, 2 July 2007, 'Nations linked by blood and Islam', *The Australian*.
Charles Ferguson, 9 Jan 2007, 'Nuclear risk could be an inside job',
www.smh.com.au/news/opinion/nuclear-risk-could-be-an-inside-job/2007/01/08/1168104921045.html

[30] http://minerals.dmitre.sa.gov.au/mines__and__developing_projects/former_mines/port_pirie_treatment_plant/about_the_plant

for a local drop in the level of Basin water, requiring the operation and maintenance of pumps which adversely impact on an already marginal operation.[31]

If the Royal Commission was so minded, it could easily find hundreds of examples of nuclear fuel cycle facilities overseas impacting on other sectors, and we are bemused at the Commission's apparent unwillingness to acknowledge the problem. A number of examples are listed in section 1.13 of our original submission – but those examples are just the tip of the iceberg. To restate just one example here, abandoned uranium mines and exploration sites in the U.S.[32] cumulatively represent a serious public health and environmental hazard, and contamination restricts uses and potential uses of land and water resources.

The Royal Commission's Tentative Findings report notes that in the event of a major nuclear accident, adverse impacts on the tourism, agriculture and property sectors could potentially be profound. It should further note that nuclear accidents have no respect for state or national boundaries; for example the impacts of Chernobyl led to severe, decades-long restrictions on primary industries across Europe. Total direct and indirect costs of the Fukushima disaster will be around US$500 billion according to a study by the American Society of Mechanical Engineers.[33] A comparable accident would not only destroy the South Australian economy, it would have profoundly adverse economic (and other) impacts at a national level.

10. REGULATION

The Royal Commission appears to have completely ignored the detailed critique of nuclear regulation in Australia presented in our original submission.

There are serious problems with regulation in SA. One example was the FoI revelation in 2013 that the radiation plans for Olympic Dam were more than 15 years out of date, with the SA Environment Protection Authority acknowledging that an update was (long) overdue.[34] If not for the FoI application and the surrounding publicity, the radiation plans would likely be more than 17–18 years out of date and counting. Nuclear fuel cycle facilities − reactors, reprocessing plants etc. − are typically more hazardous that uranium mines and the SA government's demonstrated inability to properly monitor and regulate the uranium industry should rule out any development of nuclear fuel cycle facilities.

Regulation at a national level is also highly problematic. The federal government undermined the independence of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) from the start by allowing the then Chief Executive of ANSTO to sit on panel which interviewed applicants for the position of CEO of ARPANSA. There is absolutely nothing stopping the same thing happening again and the Royal Commission should recommend a tightening of the ARPANS

[31] Sarah Martin, 9 Aug 2014, 'BHP Billiton's thirst triggers an outback water fight', www.theaustralian.com.au/national-affairs/state-politics/bhp-billitons-thirst-triggers-an-outback-water-fight/story-e6frgczx-1227018481754
See also Michael Owen, 21 Sept 2009, 'Corporate abuse' hits Great Artesian Basin, www.theaustralian.news.com.au/story/0,25197,26101722-5013404,00.html
[32] www.cleanupthemines.org
[33] American Society of Mechanical Engineers, June 2012, 'Forging a New Nuclear Safety Construct: The ASME Presidential Task Force on Response to Japan Nuclear Power Plant Events', www.asme.org/getmedia/73081de8-e963-4557-9498-f856b56dabd1/Forging_a_new_nuclear_safety_construct.aspx
[34] Miles Kemp, 7 July 2013, 'Radiation leak plan 15 years out of date', The Advertiser, www.adelaidenow.com.au/business/olympic-dam-mine-radiation-leak-plan-15-years-out-of-date/story-fni6uma6-1226675659296

Act and/or associated Regulations such that ANSTO and other regulated bodies can no longer play any role whatsoever in ARPANSA appointment processes.

Then ARPANSA CEO John Loy said in a 17 April 2000 media release that the Maralinga clean-up was "world best practice" although it clearly was not; for example shallow burial of plutonium in unlined trenches certainly would not be tolerated in the UK or the USA. The Maralinga clean-up did not even meet Australian standards – the NH&MRC Code of Practice precludes shallow burial of plutonium – yet the so-called regulator argued that it was 'world's best practice'! Given that ARPANSA was prepared to act in such a fashion in relation to the nuclear waste project at Maralinga in SA, there are legitimate concerns that ARPANSA would do the same in relation to future nuclear proposals in SA including national or international waste repositories or stores, or nuclear fuel cycle facilities.

ARPANSA's weakness was illustrated during the OPAL reactor licensing process. Then ARPANSA CEO John Loy repeatedly stated that a reactor construction licence would not be granted unless progress was made towards the establishment of a store for long-lived intermediate-level waste (LLILW). Yet a reactor construction licence was issued by ARPANSA, and later a reactor operating licence, without a LLILW store being in place, and without firm plans in place towards the establishment of a store, and with no progress towards a final disposal site and facility for LLILW.

There is no mention in the Tentative Findings report of critical reports of ARPANSA's performance by the Australian National Audit Office. For example the 2005 Australian National Audit Office report was critical of ARPANSA said:[35]

- [O]verall management of conflict of interest is not sufficient to meet the requirements of the ARPANS Act and Regulations. ... Potential areas of conflict of interest are not explicitly addressed or transparently managed.
- 75% per cent of license assessments were made without the support of robust, documented procedures.
- ARPANSA does not monitor or assess the extent to which licensees meet reporting requirements. The ANAO found that there had been under-reporting by licence holders.

Problems with ARPANSA persist. Since 2007 ARPANSA has been drawn into an unseemly process regarding incidents and accidents at ANSTO's Lucas Heights site and its treatment of whistleblowers. ARPANSA issued two contradictory reports on the issue, leading the Minister to establish an inquiry into ARPANSA. The ABC reported in July 2011:
"The Health Department's audit and fraud control branch has been investigating how ARPANSA handled allegations of safety breaches and bullying at the nation's only nuclear reactor in Sydney. Whistleblowers had alleged ARPANSA was too close to the Australian Nuclear Science and Technology Organisation (ANSTO), which runs the Lucas Heights research facility. The whistleblowers claimed that safety reports were being compromised. The Health Department review also questioned ARPANSA's impartiality."[36]

In 2011, the then Parliamentary Secretary for Health and Ageing, Catherine King, announced a review into ARPANSA's regulatory powers following the receipt of an independent audit by the Audit and Fraud Control Branch of the Department of Health and Ageing into ARPANSA's handing of two safety incidents at ANSTO in September 2007 and August 2008. The audit found

[35] www.foe.org.au/sites/default/files/Audit%20Office%20-%20ARPANSA.pdf
[36] www.abc.net.au/news/stories/2011/07/07/3264086.htm
See also: www.abc.net.au/news/stories/2011/03/30/3178186.htm
See also: www.foe.org.au/ansto-whistleblower-saga-2007-ongoing

that while the incidents were investigated and concluded at the time, there was a lack of consistency in evidence and transparency in the handling of one of the incidents.[37]

The ABC reported:[38]
Australia's nuclear industry regulator, ARPANSA, is under review over its handling of safety breaches at the nation's only nuclear reactor. Last year, ABC 1's Lateline revealed allegations of serious safety and operational breaches at the Lucas Height's reactor in Sydney, which were later backed up by Australia's workplace regulator, Comcare. A departmental investigation was launched by Science Minister Kim Carr last month, but now a party to that investigation - ARPANSA - is itself under review. The Chief Auditor is investigating how ARPANSA handled the original allegations of safety breaches and bullying at the nuclear site. ARPANSA last year released two conflicting reports on the claims at the Lucas Heights facility.

The final report of the Royal Commission should shed light on some questions posed in our original submission:

- The relevant Minister is empowered by the ARPANS Act to override decisions made by the CEO of ARPANSA. Does the Commission consider this appropriate, and are there similar provisions in legislation in other comparable countries?
- Is it (still) the case that Section 83 of the ARPANS Act allows for a law of a State or Territory to be prescribed such that it does not apply to the activities of controlled persons under the Act? In other words, the ARPANS Act can be used to override state/territory legislation prohibiting legislation, such as state legislation prohibiting the establishment of a radioactive waste repository or store?
- What size workforce would be required to oversee a nuclear power program in Australia? To what extent could additional regulatory staff be recruited from overseas? Would educational / training facilities be required in Australia; and if so at what cost, and who would bear that cost?
- How might problems overseas − such as the ageing of the nuclear workforce and the nuclear regulatory workforce − impact on efforts to establish a suitable regulatory infrastructure for nuclear power in Australia?

11. INSURANCE AND LIABILITY

The Tentative Findings report seems to be endorsing existing insurance/liability arrangements with this statement:
"An existing international regulatory framework provides guidance for compensating victims of damage from nuclear processing, power generation and waste, including strict and unlimited liability channelled to the operator that has the greatest control of the risk. The implementation of such laws is an expectation of the international community and a requirement of nuclear operators. In Australia, this would require new federal legislation."

Existing arrangements give manufacturers and suppliers a free ride. They drive safety standards downwards by absolving manufacturers and suppliers of any responsibility. The final report of the Royal Commission should discuss those problems and recommend that if any nuclear fuel cycle

[37] Catherine King, 7 July 2011, Media Release: 'Review of Regulatory Powers of the Australian Radiation Protection and Nuclear Safety Agency'.
[38] ABC, 30 March 2011, 'Nuclear regulator investigated over safety review', www.abc.net.au/news/stories/2011/03/30/3178186.htm
See also: www.emfacts.com/2011/07/arpansa-being-investigated-for-improper-relationship-with-nuclear-agency/
See also: ABC, 8 July 2011, 'Nuclear regulator 'too close' to ANSTO', ww.abc.net.au/news/stories/2011/07/07/3264086.htm

facilities are developed in Australia, there should be some mechanism to hold manufacturers and suppliers accountable.

India's 2010 legislation is an example of national legislation which does not completely absolve manufacturers and suppliers of responsibility. Why does the Royal Commission ignore this example?

There is a vast literature on problems with insurance and liability arrangements – all of which appears to have been ignored by the Royal Commission. See for example the following report which benefits from an analysis of how inadequate insurance and liability arrangement contributed to the Fukushima disaster:
Antony Froggatt, Dr David McNeill, Prof Stephen Thomas and Dr Rianne Teule, February 2013, 'Fukushima Fallout: Nuclear business makes people pay and suffer', www.greenpeace.org/international/Global/international/publications/nuclear/2013/FukushimaFallout.pdf

Here is a summary of some of the issues:

> ***Whistleblowers show need for nuclear industry accountability***
> *Greg McNevin*
> *Nuclear Monitor #758, 15 March 2013*
> *www.wiseinternational.org/nuclear-monitor/758/whistleblowers-show-need-nuclear-industry-accountability-greg-mcnevin-greenpeace*
> *The triple meltdown at the Fukushima Daiichi nuclear power plant – the worst nuclear accident since Chernobyl – not only all but ruined the Tokyo Electric Power Company (TEPCO), one of the largest energy utilities in the world, it also highlighted the total lack of responsibility suppliers of nuclear reactors have in the event of a nuclear accident.*
> *The plant made up less than 5% of TEPCO's business, but the losses it sustained when three of its six reactors exploded in 2011 soon far exceeded the value of the entire company. Putting aside the immense threats to the health of the people and environment surrounding the plant, having such potential for financial ruin lurking in such a small part of a company's business makes it startling that anyone would be prepared to take such a risk. Yet in the nuclear business, this risk is not treated like the huge gamble it is in reality. In most cases, nuclear safety laws protect nuclear operators from paying all but a small fraction of the costs of a disaster, and these laws also protect the suppliers of reactors and other equipment from paying any of the costs of a disaster. This increases risk for operators, for people, for the environment, and for national economies.*
> *Take former Babcock-Hitachi engineer Mitsuhiko Tanaka's story for example. Tanaka exposed a critical flaw in the reactor pressure vessel of the now-exploded number 4 reactor at Fukushima Daiichi. This flaw did not contribute to the explosion itself, but it is a shocking example of the cost of failure, and the great lengths the nuclear industry goes to keep the myth of nuclear safety alive.*
> *When a manufacturing flaw can bankrupt a company, but it is covered up only to create a potential Fukushima-scale meltdown, then there is a serious problem with the technology, the company behind it, and with laws that don't hold this company responsible.*
> *The Fukushima Daiichi plant was made up almost entirely of reactors with flaws. Dale Bridenbaugh, a General Electric (GE) engineer who quit the company and became a whistleblower in the US. He encountered the dangerous potential of nuclear power in the mid-1970s. When he alerted his employer to the serious issues with the containment vessels it designed and manufactured, GE was more interested in protecting its bottom line.*

The substantial risk of failure caused Bridenbaugh to push for the reactors to be shut down for repair, which could have scuttled GE's nuclear business completely. GE chose to keep them online, eventually deploying one at Fukushima Daiichi.
As Tanaka says: "when the stakes are raised to such a height, a company will not choose what is safe and legal. Even if it is dangerous they will choose to save the company from destruction."
You might think "if the fault makes the chance of a major accident so high, why would companies like Hitachi and GE still take such a huge risk?"
You could say possible bankruptcy in the future is better than certain bankruptcy now, however, the shocking reality is these companies, even when they supplied flawed equipment, are not liable for any damage caused by their faulty nuclear technology.
The huge risks the nuclear industry poses were always clear, so in order to create conditions for the technology to flourish, regulations were written to ensure no supplier would be liable for damages in the case of a nuclear accident, and the utilities running the plants would have a cap for how much they would pay.
Nuclear companies around the world are given a free ride to profit, while taxpayers are put on the hook for the hugely expensive damages when an accident inevitably happens. Worse still, this happens when they are also suffering the tremendous damage a meltdown does to their health, their environment, and their communities.
Given the scope of disaster can far outweigh the worth of any one company, this needs to change. The polluter pays principle needs to be applied in the nuclear industry as it is elsewhere. All nuclear companies need to be made accountable and liable for the disasters they cause. If they are not, then we will have learned no real lessons from Fukushima.

The Tentative Findings report notes that the amount of commercial insurance cover mandated by the international agreements is apparently inadequate to fully compensate victims and remediate the environment in a catastrophic scenario at a nuclear power plant" and "that the state and federal governments would become insurers of last resort." The final report should be blunter: the economic costs fall on the general public.

12. TRANSPORT

The Tentative Findings report states:
"During the past 50 years, approximately 7000 international shipments of used nuclear fuel, including nine that have left Australia for reprocessing, have been undertaken. In this time, no accident involving a breach of the package and the release of its contents has occurred. The same record applies to international transport of high and intermediate level waste."

The Royal Commission need only have read our original submission to realise that the above claim is false.

For example:

Germany − a nuclear 'cartel of liars'
A whistleblower supplied the WISE-Paris NGO with information which sparked a major controversy over frequent excessive radioactive contamination of waste containers, rail cars, and trucks.[39] Nuclear waste shipments from German nuclear reactor sites to reprocessing plants in the

[39] WISE-Paris, Plutonium Investigation, No.6, May-June 1998,
www.wise-paris.org/index.html?/english/ournewsletter/6_7/contents.html
and
www.wise-paris.org/english/ournewsletter/6_7/no6_7.pdf

UK and France were banned, and transport within France was suspended, in the aftermath of the controversy.

WISE-Paris summarised the controversy:[40]

> *There are two scandals, both unprecedented. The first lies in the fact that for 15 years the nuclear industry - power plants, transport companies, plutonium factories and nuclear safety institutes in France, Germany, Switzerland and the UK at least - have managed to hide the fact that the international transport regulations for spent fuel shipments have been constantly violated, up to levels exceeding several thousand times the limit. This is all the more stunning as the original recommendation stems from the industry friendly, heavily pro-nuclear International Atomic Energy Agency (IAEA) in Vienna.*
>
> *The second scandal derives from the fact that the French nuclear safety authority DSIN has been aware of the problem since autumn 1997, agreed with the French nuclear industry representatives over the wording of a mere "cleanliness problem", and kept silent until a journalistic investigation brought the story to light. The safety authority neither informed its ministers nor its foreign counterparts and, of course, nor did it inform the public. Worse, when the story broke, the authority played the role of the tough transparent State control agency finally cleaning up ... without actually taking any kind of regulatory or disciplinary consequences, while downplaying health consequences and the persistent outrageous violation of regulations.*
>
> *The risk seems rather high that people have been exposed to significant levels of radiation over the period the contaminated transports have crossed countries. Worse, hot particles have been spread into the environment along rail tracks and roads. People might actually continue to get contaminated presently and for a long time to come.*
>
> French Environment Minister Dominique Voynet said: *Beyond the level of contamination, I'm shocked by the fact that as soon as one asks some simple questions to the operators, one realises that this has been going on for years, that the three companies questioned (EDF, Transnucléaire, COGEMA) were perfectly aware of it and that they have not said anything.*
>
> In Germany, an opinion poll found that 72% of respondents thought that further nuclear waste shipments would be "irresponsible". The opinion poll found a dramatic increase in opposition to nuclear power, with 76% of respondents supporting the idea of a law to phase out nuclear power. The police trade union speaker Konrad Freiberg called the nuclear industry a "cartel of liars" which "has driven democracy against the wall".

Here is another example: 23 December 2013: A rail freight wagon carrying nuclear waste was derailed at a depot in Drancy, 3 km northeast of Paris. The wagon carried spent fuel from the Nogent nuclear power plant destined for AREVA's reprocessing plant at La Hague in Normandy. Although no leakage of radiation was measured at the accident location, the Nuclear Safety Authority (ASN) reported that subsequent testing by AREVA revealed a hotspot on the rail car that delivered a dose of 56 microsievert. An investigation into the origin of the contamination is underway.[41]

Here is another example. A serious nuclear transport incident occurred in the UK in 2002.[42] AEA Technology was fined £250,000 for the incident during a 130-mile truck journey. A highly

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[40] www.wise-paris.org/index.html?/english/ournewsletter/6_7/editorial.html&/english/frame/menu.html

[41] International Panel on Fissile Materials, 21 Jan 2014, http://fissilematerials.org/blog/2014/01/nuclear_train_accident_in.html

[42] UK Health and Safety Executive, 2006, 'Transport case prompts HSE reminder on the importance of radiation protection controls', www.hse.gov.uk/press/2006/e06017.htm
See also: 'Firm fined £250,000 over radioactive leak', The Scotsman, 21 February 2006, http://news.scotsman.com/topics.cfm?tid=112&id=267752006
See also: 'Toxic truck leak a radiation near-miss', 22 February 2006, www.theaustralian.news.com.au/common/story_page/0,5744,18231965%5E2703,00.html

radioactive beam was emitted from a protective flask as it was driven across northern England and it was "pure good fortune" that no-one was dangerously contaminated, Leeds Crown Court was told. The problem arose when a plug was left off a specially-built 2.5-tonne container carrying radioactive material on a lorry. Staff used the wrong packaging equipment and failed to carry out essential safety checks before the radioactive cobalt-60 (decommissioned cancer treatment equipment) was transported from West Yorkshire to Cumbria. The court heard the 8mm-wide beam of radiation escaped through the bottom of the flask, pointing directly into the ground, throughout the three-hour road journey. Had the beam travelled horizontally, anyone within 280 metres would have been at risk of contamination from a beam of gamma rays up to 1000 times more powerful than a "very high dose rate". Radiation experts from the Health and Safety Executive said that anyone exposed to the beam could have exceeded the legal dose within seconds and suffered burns within minutes. One scientist estimated that someone standing a metre from the source and in the direct path of the rays would have been dead in two hours. The judge, Norman Jones, QC, said staff at the firm had acted in a "cavalier and somewhat indifferent" manner with a "degree of arrogance" towards their duties. He said the risk from the leak had been "considerable". In addition to the fine, he ordered the company to pay more than £150,000 in costs to the UK Health and Safety Executive.

No doubt there are other examples of dangerous transport accidents involving spent fuel / high level waste. The Royal Commission should either do the requisite research or commission a study. The Royal Commission has failed to carry out the necessary research, ignored information provided to it in submissions, and repeated false industry claims regarding nuclear transport.

The final report of the Royal Commission should note there have been **other train derailments** involving nuclear waste. For example, a train carrying three casks with about 180 tons of high-level radioactive waste derailed near Apach (France) on 3 February 1997. The waste was on its way from the nuclear power plant in Lingen (Germany) to Sellafield, UK, for reprocessing. The train was going at about 30 kilometres per hour, and the casks did not turn over. The incident was not a unique event. On 15 January 1997 a nuclear fuel cask derailed in front of the German nuclear power plant at Krümmel during a track change, and on 3 February 1997 the engine driver of a nuclear waste transport from Krümmel suffered from a faint.[43]

The Royal Commission has completely ignored readily available information on international experiences with nuclear transportation. The information could hardly be more readily available – it was summarised in our original submission. Our organisations urge the Commission to revisit and more accurately reflect this issue in the final report.

UK: The final report should note that transport incidents and accidents are routine in countries with significant nuclear industries. The case of the UK is pertinent. A UK government database − RAdioactive Material Transport Event Database (RAMTED) − contains information on 1018 events from 1958 to 2011 (an average of 19 incidents each year).[44] Of 806 incidents in the UK between

[43] WISE News Communique #467, February 28, 1997
Die Tageszeitung (FRG) February 5, 1997
Greenpeace press release February 4, 1997

[44] Some recent annual reviews of transport incidents in the UK are posted at
http://webarchive.nationalarchives.gov.uk/20140722091854/www.hpa.org.uk/Publications/Radiation/CRCEScientificAndTechnicalReportSeries/
Some earlier annual reviews are posted at:
http://webarchive.nationalarchives.gov.uk/20140722091854/www.hpa.org.uk/Publications/Radiation/HPARPDSeriesReports/
The most recent annual review is as follows: M.P. Harvey and A.L Jones, Aug 2012, 'HPA-CRCE-037 - Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive

1958−2004, 2.3% (19 incidents) resulted in individual whole-body doses over 1 mSv, or extremity doses over 50 mSv. There were 187 events during the shipment of irradiated nuclear fuel flasks from 1958−2004 in the UK[45] − 23% of the total number of 806 recorded incidents :

- 33% involved excess contamination on the surface of the flask;
- 24% involved collisions and low speed derailments of the conveyance;
- 16% involved flask preparation faults, and loading/unloading faults;
- 13% involved excess contamination of conveyance;
- 11% involved faults with the conveyance; and
- the remainder included three cases involving fire on a locomotive with no damage to flasks

Canada: Since 2010, more than one truck in seven carrying radioactive material has been pulled off the road by Ontario ministry of transportation inspectors for failing safety or other requirements.[46] The information is contained in a notice filed with a panel studying a proposal to establish a radioactive waste repository near Kincardine. The notice states that since 2010, inspectors examined 102 trucks carrying "Class 7 Dangerous Goods (Radioactive material.)" Of those, 16 were placed "out-of-service," which means the vehicle "must be repaired or the violation corrected before it is allowed to proceed." Violations included: faulty brake lights; "load security" problems; flat tires; false log; damaged air lines; and a driver with no dangerous goods training. In other cases, trucks were allowed to proceed but were slapped with enforcement actions for problems with hours of service; annual inspection requirement; missing placards; exceed gross weight limit; speed limiter; overlength combination; overheight vehicle; vehicle registration / insurance. In total, 25 of the 102 inspections − nearly one in four − resulted in the vehicle being place out-of-service and / or enforcement action taken against the operator of the vehicle.

France: In 2008, the French nuclear safety agency IRSN produces a report summarising radioactive transport accidents and incidents from 1999−2007. The IRSN manages a database listing reported deviations, anomalies, incidents and accidents (known in a generic way as "events") relating to transport. The database lists 901 events from 1999−2007 − on average 100 events annually or about two each week. The IRSN report notes:[47]

- Events where there is contamination of packages and means of transport were still frequent in 2007.
- The number of events related to a defect in package stowing was significant, as was the number involving shocks on packages during handling. "Analysis of these two types of event reveals failures of information or training of the operators."
- "A number of events have been induced by human error in conditioning the radioactive contents of the packages, leading to significant consequences on the safety of the package. In particular, the incident with the highest level of gravity on the INES scale since 1999 (an incident which occurred

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Materials in the UK – 2011 Review',
www.hpa.org.uk/Publications/Radiation/CRCEScientificAndTechnicalReportSeries/HPACRCE037/

[45] J.S. Hughes, D. Roberts, and S.J. Watson, July 2006, 'Review of Events Involving the Transport of Radioactive Materials in the UK, from 1958−2004, and their Radiological Consequences',
http://webarchive.nationalarchives.gov.uk/20140714084352/www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1194947346295

[46] John Spears, 15 Nov 2013, 'Trucks with radioactive cargo fail inspections',
www.thestar.com/business/2013/11/15/trucks_with_radioactive_cargo_fail_inspections.html
Ministry of Transportation − Undertaking #61: www.ceaa-acee.gc.ca/050/documents/p17520/95562E.pdf

[47] IRSN (France), 21 October 2008, 'Information report: Incidents in transport of radioactive materials for civil use: IRSN draws lessons from events reported between 1999 and 2007',
www.irsn.fr/EN/publications/technical-publications/Documents/IRSN_ni_transports_analysis_20081021.pdf
www.irsn.fr/EN/Library/Documents/IRSN_ni_transports_analysis_20081021.pdf
www.irsn.fr/EN/Pages/home.aspx

on 27th December 2001 at Roissy airport during transit between Sweden and the United States) is linked to an error in packaging iridium capsules in the package, which led to their displacement in a portion of the cavity without radiation protection."

- "Finally, efforts should continue to prevent losses of packages and, if necessary, to find the lost packages quickly in order to avoid significant risks to uninformed persons in the event of unsupervised opening of these packages."

USA: In the eight years from 2005 to 2012, 72 incidents involving trucks carrying radioactive material on US highways caused US$2.4 million in damage and one death, according to the Transportation Department's Pipeline and Hazardous Materials Safety Administration.[48]

Potential costs of transport accidents: The Royal Commission's final report should note the potential for spent fuel / high level nuclear waste transport accidents to be extraordinarily expensive. Dr. Marvin Resnikoff and Matt Lamb from Radioactive Waste Management Associates in New York City calculated 355−431 latent cancer fatalities attributable to a "maximum" hypothetical rail cask accident, compared to the US Department of Energy's estimate of 31 fatalities. Using the Department of Energy's model, they calculated that a severe truck cask accident could result in US$20 billion to US$36 billion in cleanup costs for an accident in an urban area, and a severe rail accident in an urban area could result in costs from US$145 billion to US$270 billion.[49]

13. HIGH-LEVEL NUCLEAR WASTE

OVERSEAS EXPERIENCE

The Tentative Findings report asserts that Finland and Sweden "have successfully developed long-term domestic solutions" for spent fuel. That is an extraordinary assertion given that neither country has completed *construction* of a repository let alone demonstrated safe *operation* over any length of time.

The Royal Commission has completely ignored the failure of the world's only deep underground nuclear waste repository – the Waste Isolation Pilot Plant (WIPP) in the U.S. The WIPP story is a case study of a sharp decline in safety and regulatory standards over a short space of time. A salt truck fire on 5 Feb. 2014 was followed by a chemical explosion on 14 Feb. 2014. The explosion resulted in a multi-year shut-down of the repository with costs likely to exceed US$500 million.[50]

We question why the Royal Commission ignores the failure of the world's only existing deep underground nuclear waste repository and argues that the partial *construction* of two repositories in Finland and Sweden is a success story. It appears that the Royal Commission has abandoned evidence-based analysis in favour of advocacy.

At a public meeting in Adelaide Town Hall in February 2016, the Royal Commissioner said that WIPP has been ignored because it involved different waste forms (long-lived intermediate-level waste) of military origin. In fact, the waste that the Royal Commission recommends that South Australia import in large volumes is **vastly more hazardous** than the waste managed at WIPP.

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[48] Anna M. Tinsley, 15 April 2012, 'Radioactive waste may soon travel on DFW highways', http://web.archive.org/web/20130504150446/www.star-telegram.com/2012/04/15/3884220/radioactive-waste-may-soon-travel.html

[49] 7 July 2000, www.state.nv.us/nucwaste/news2000/nn10719.htm

[50] www.foe.org.au/wipp

Moreover the Royal Commission has overlooked the fundamental lesson from the WIPP fiasco – initially high safety and regulatory standards gave way to complacency, cost-cutting and corner-cutting over the space of only 10–15 years. Even if it was assumed that the South Australia government performed better than the U.S. government, there is no rational reason to believe that spent fuel management would be accident- and incident-free over long timespans. Moreover there is no rational reason to believe that successive S.A. governments will be able to avoid complacency, cost-cutting and corner-cutting setting in over the timespans involved. As the Royal Commission notes, spent fuel "requires isolation from the environment for many hundreds of thousands of years".

Here is a summary of the U.S. government's report on the WIPP chemical explosion:[51]

> *A Department of Energy-appointed Accident Investigation Board identified the "root cause" of the accident to be the many failings of Nuclear Waste Partnership (NWP), the contractor that operates the WIPP site, and DOE's Carlsbad Field Office. The report criticises their "failure to fully understand, characterize, and control the radiological hazard. The cumulative effect of inadequacies in ventilation system design and operability compounded by degradation of key safety management programs and safety culture resulted in the release of radioactive material from the underground to the environment, and the delayed / ineffective recognition and response to the release."*
>
> *The Accident Investigation Board report concludes that the release of radioactive plutonium and americium was "preventable", and that "a thorough and conservatively considered hazard analysis, coupled with a robust, tested and well maintained HEPA [high-efficiency particulate air] filter capable exhaust ventilation system could have prevented the unfiltered above ground release that occurred on February 14, 2014."*
>
> *The Accident Investigation Board identified eight "contributing causes":*
> *1. Implementation of the NWP Conduct of Operations Program is not fully compliant with DOE's Conduct of Operations and this impacted the identification of abnormal conditions and timely response.*
> *2. NWP does not have an effective Radiation Protection Program, including but not limited to radiological control technician training, qualification and requalification, equipment and instrumentation, and audits.*
> *3. NWP does not have an effective maintenance program. The condition of critical equipment and components, including continuous air monitors, ventilation dampers, fans, sensors, and the primary system status display were degraded to the point where the cumulative impact on overall operational readiness and safety was not recognized or understood.*
> *4. NWP does not have an effective Nuclear Safety Program. There has been a reduction in the conservatism in the Documented Safety Analysis hazard / accident analysis and corresponding Technical Safety Requirement controls over time. For example, 15 of 22 design basis accidents were removed from the latest revision without any clear justification, including the elimination of a roof/rib fall event in an open waste panel.*
> *5. NWP implementation of DOE's Comprehensive Emergency Management System was ineffective. Personnel did not adequately recognize, categorize, or classify the emergency and did not implement adequate protective actions in a timely manner.*
> *6. The current site safety culture does not fully embrace and implement the principles of DOE's Integrated Safety Management Guide. There is a lack of a questioning attitude, reluctance to bring up and document issues, and an acceptance and normalization of*

[51] www.wipp.energy.gov/Special/AIB_Final_WIPP_Rad_Release_Phase1_04_22_2014.pdf

degraded equipment and conditions. There is a reluctance to report issues to management, indicating a chilled work environment.
7. Oversight by DOE's Carlsbad Field Office was ineffective. DOE failed to establish and implement adequate line management oversight programs and processes and hold personnel accountable.
8. DOE Headquarters line management oversight was ineffective. DOE Headquarters failed to ensure that the Carlsbad Field Office was held accountable for correcting repeated identified issues involving radiological protection, nuclear safety, Integrated Safety Management, maintenance, emergency management, work planning, and control and oversight.

The Royal Commission has also ignored the mismanagement of radioactive waste in South Australia. A radioactive waste repository at Radium Hill, for example, "is not engineered to a standard consistent with current internationally accepted practice" according to a 2003 SA government audit. And the 'clean-up' of Maralinga in the late 1990s was deeply flawed:

- Nuclear engineer and whistleblower Alan Parkinson said of the 'clean-up': "What was done at Maralinga was a cheap and nasty solution that wouldn't be adopted on white-fellas land."[52]
- Scientist and whistleblower Dale Timmons said the government's technical report was littered with "gross misinformation".[53]
- Geoff Williams, an officer with the Commonwealth nuclear regulator ARPANSA, said that the 'clean-up' was beset by a "host of indiscretions, short-cuts and cover-ups".[54]
- Nuclear physicist Prof. Peter Johnston (now with ARPANSA) noted that "there were ... very large expenditures and significant hazards resulting from the deficient management of the project by DEST [the Department of Education, Science and Training]."[55]

ENVIRONMENTAL AND PUBLIC HEALTH RISKS

The claim that "South Australia has a unique combination of attributes which offer a safe, long-term capability for the disposal of used fuel" is simply not proven or supported. Australia / South Australia has a track record of mismanaging radioactive waste (Radium Hill, Maralinga, etc), zero experience managing high-level nuclear waste and zero expertise managing high-level nuclear waste.

The Tentative Findings report asserts that SA has "low levels of seismic activity overall and, in some parts, very low levels relative to elsewhere in the world." Yet Dr Mike Sandiford from the School of Earth Sciences at University of Melbourne writes: "Australia is relatively stable but not tectonically inert, and appears to be less stable than a number of other continental regions. Some places in Australia are surprisingly geologically active."[56]

The Tentative Findings report states that SA has "a mature and stable political, social and economic structure". Such comments need to be placed in the context of the longevity of nuclear waste. It

[52] ABC Radio, Aug 2002. A number of Mr Parkinson's papers and submissions are posted at www.foe.org.au/anti-nuclear/issues/oz/britbombs/clean-up. See also Alan Parkinson, 12 June 2015, Submission to Nuclear Fuel Cycle Royal Commission, http://nuclearrc.sa.gov.au/app/uploads/2016/03/Alan-Parkinson-12-06-2015.pdf
[53] http://pandora.nla.gov.au/pan/30410/20090218-0153/www.geocities.com/jimgreen3/martac.html
[54] ABC Background Briefing, 16 April 2000, 'Maralinga: The Fall Out Continues', www.abc.net.au/radionational/programs/backgroundbriefing/maralinga-the-fall-out-continues/3466242
[55] 2004, Submission to ARPANSA inquiry into proposed repository in SA, www.foe.org.au/anti-nuclear/issues/oz/britbombs/clean-up
[56] ABC, 'Ask an Expert', www.abc.net.au/science/expert/realexpert/nuclearpower/08.htm

takes about 300,000 years for the radioactivity of spent fuel to decline to that of the original uranium ore.[57] Australia has had one profound political revolution in the past 250 years (European colonisation) and is therefore on track for 1,200 political revolutions over the 300,000-year lifespan of nuclear waste.

European colonisation has profoundly affected Australia's political, social and economic structure and it has profoundly affected the natural environment. CSIRO scientists Dr Jon Olley and Dr Peter Wallbrink state that new scientific evidence indicates that since European colonisation, Australians have had a "far more catastrophic impact on their landscape than previously suspected" and European settlement "unleashed an episode of erosion, sediment deposition and change in river systems orders of magnitude greater than we have assumed to date."[58] Dr Wallbrink states: "There's little doubt modern Australians have underestimated the extent of change we have inflicted on our landscape. In some cases the rates are staggering. We're talking about changing the very face of Australia in comparatively few years, so dramatic is the scale of these events."

NUCLEAR WEAPONS PROLIFERATION

The Tentative Findings report asserts that "Australia has a direct interest in preventing nuclear weapons proliferation". No-one would disagree with that statement but the implicit argument that accepting international spent fuel / high-level waste would in any way prevent proliferation is highly questionable and, as with so many other assertions in the Tentative Findings report, is presented without any supporting evidence.

As discussed above ('Weapons Proliferation – "Sound" non-proliferation credentials?'), Australia relies on the U.S. nuclear 'deterrent', provides practical and political support to the U.S. nuclear weapons program, and consistently undermines non-proliferation initiatives. Australia has (nominally) supported various multilateral/international initiatives aimed at capping or reducing the number of weapons-capable states. Yet the Royal Commission's proposal – importation of vast amounts of spent fuel containing vast amounts of weapons-useable plutonium – runs counter to those initiatives given that Australia currently has negligible quantities of weapons-useable fissile material.

ECONOMICS

It beggars belief that the Jacobs report envisages that the decommissioning fund (Reserve Fund) would not receive a single cent until year 45. It beggars belief that the Royal Commission would present those figures and assumptions without comment. Obviously there is a risk of money being invested in a project which does not reach fruition (as with Yucca Mountain, to give just one example). Obviously decommissioning funds would need to be set aside from the start. The model being put forward by the Commission risks massive future cost shifting to the SA public sector and taxpayer.

In relation to uranium mining, the Tentative Findings report states "The risk of post decommissioning impacts from exploration and mining is addressed by a regulator holding a financial security or bond in the amount of the estimated cost of remediation. The value of the bond is usually adjusted over the mine's operational life."

Yet for a high-level international nuclear waste dump it would be acceptable to leave the decommissioning fund empty until year 45? Why?

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[57] https://theconversation.com/the-case-for-nuclear-power-despite-the-risks-41552
[58] https://bertramr.files.wordpress.com/2011/12/wallbrink-1999.pdf

Our organisations contest the Commission's summation of the status of mining decommissioning models but at least these recognise early provision for pre-mature closure. We fail to understand why such a basic precaution would not be actively required in a project of the scope of that being advanced by the Commission.

The Tentative Findings report states that the fund for decommissioning, remediation, closure and long-term monitoring activities would amount to about $32 billion by year 83. Most likely a vastly greater amount would be necessary. The U.S. Department of Energy estimated that the cost of construction and operation of Yucca Mountain over a 150-year period would be US$96 billion (A$135 billion).[59] Tens or hundreds of billions more would be required over subsequent centuries and millennia.

The Jacobs report states: "Funds must also be set aside for many hundreds of years of ongoing monitoring of these underground sites" (p.210-11). Monitoring would be required not just for many centuries but for millennia. Monitoring is required for millennia because:

- While the radioactivity of spent fuel / high-level waste nuclear waste declines, radioactivity persists for millennia (as the Royal Commission notes, spent fuel "requires isolation from the environment for many hundreds of thousands of years").
- The probability of failure of engineered barriers increases century after century, millennia after millennia.
- Proliferation and security risks persist for millennia.

The Tentative Findings report presents some speculative figures on $/tHM and asserts that those figures "take account of the lowest willingness-to-pay figure, establishment, operational and post-closure costs ... a higher figure could be negotiated in a range of circumstances." The figures on revenue per tHM are at the upper end of plausible estimates yet the Royal Commission asserts that a "higher figure could be negotiated" without noting the possibility of lower figures?

That said, the Tentative Findings report later states that the project would be viable even in the event of large cost overruns, smaller market share, or a significantly lower price. Would the project be viable if all three of those factors came into play? Moreover the assertion is questionable given that cost overruns overseas have proven to be spectacular. For example waste management costs estimates in the UK have risen from a 2005 estimate of £56 billion to the 2012 estimate of £100 billion – almost double.[60] While the Royal Commission makes some allowance for cost overruns it does not make allowance for the level of cost overruns that have been demonstrated overseas.

The Royal Commission's final report should provide some perspective to its claim that 600 operational / long-term jobs would be created. According to the Australian Bureau of Statistics, there are 11,909,900 'employed persons' in Australia as of January 2016. The high-level nuclear waste storage/disposal project would increase the total by 0.005 percent.

The Royal Commission should justify its implausible claim that "the effect on employment would be about 9600 jobs by 2029–30" due to "economy-wide effects". The use of multipliers is contested at the best of times and it is implausible that a project generating 600 long-term jobs would have such a large economy-wide effect.

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[59] www.world-nuclear-news.org/WR-Yucca_Mountain_cost_estimate_rises_to_96_billion_dollars-0608085.html

[60] Jonathan Leake, 9 Dec 2012, 'Nuclear cleanup to take 120 years and cost £100bn', www.thesundaytimes.co.uk/sto/news/uk_news/National/article1173042.ece

The Tentative Findings report states that "the capital costs of a minimal-scale facility would be met by a pre-commitment of 15 500 tHM of used fuel ... at $1.75 million per tHM." Presumably that means that the capital costs of a minimal-scale facility would be around 15,500x$1.75m=$27 billion? If so, the final report should simply state that minimal capital costs would be of the order of $27 billion.

14. CONCLUSION

Our organisations maintain that there are significant and material evidential deficiencies and errors of fact in the Commission's tentative findings that undermine both the credibility and utility of the document and the wider Commission process. We urge the Commission to revisit these and ensure these are actively addressed in the Commission's final report. This is particularly important in relation to the one activity that the Commission is seeking to advance through this process – the storage and disposal of high-level international radioactive waste in South Australia. We maintain that the Commission's tentative findings fail to adequately reflect the clear international history of complexity, cost, contest and project failure in relation to radioactive waste management. This experience is of profound importance in framing any future discourse on this highly contested public policy arena and we believe that Commission has a clear responsibility to ensure that its final report is based on detailed analysis, not industry advocacy.