



ALTERNATIVE ANNUAL REPORT

2012



This Alternative Annual Report has been compiled in the public interest to highlight the health, social, economic and environmental impacts of Toro Energy projects.

## CONTENTS

Summary .....	page 1-2
Proposed Wiluna uranium mine.....	page 3-6
Uranium and health: Toro promotes dangerous junk science.....	page 7 - 9
Nuclear power and nuclear waste.....	page 10- 13
The barriers to an expansion of nuclear power.....	page 14 - 20
Appendix: Radiation risks to uranium miners.....	page 21-22
References .....	page 23-24



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# SUMMARY

Toro Energy is a publicly listed mining company which hopes to establish the first uranium mine in Western Australia at Lake Way near Wiluna, north of Kalgoorlie.

Toro downplays the problems and risks associated with uranium mining and promotes the discredited notion that low-level ionising radiation is actually beneficial to human health – this is not only poor science, it is dangerous.

This report seeks to demonstrate the problems facing the uranium industry and the range of risks and obstacles facing Toro Energy's development plans.

Toro Energy formed in 2006 and merged with Nova Energy in 2007. Oxiana was a major shareholder in both companies and now Oz Minerals is Toro's largest shareholder, with a holding of around 40%. Nova held a number of tenements around Toro's flagship project at Wiluna – and there is a clear ambition to mine uranium at a number of sites around Wiluna, greatly increasing the impact on the environment, water sources and the community in the region. The increased scope of its plan to mine uranium in the region has not been assessed or documented.



Gold mine on bed of Lake Way - Wiluna.



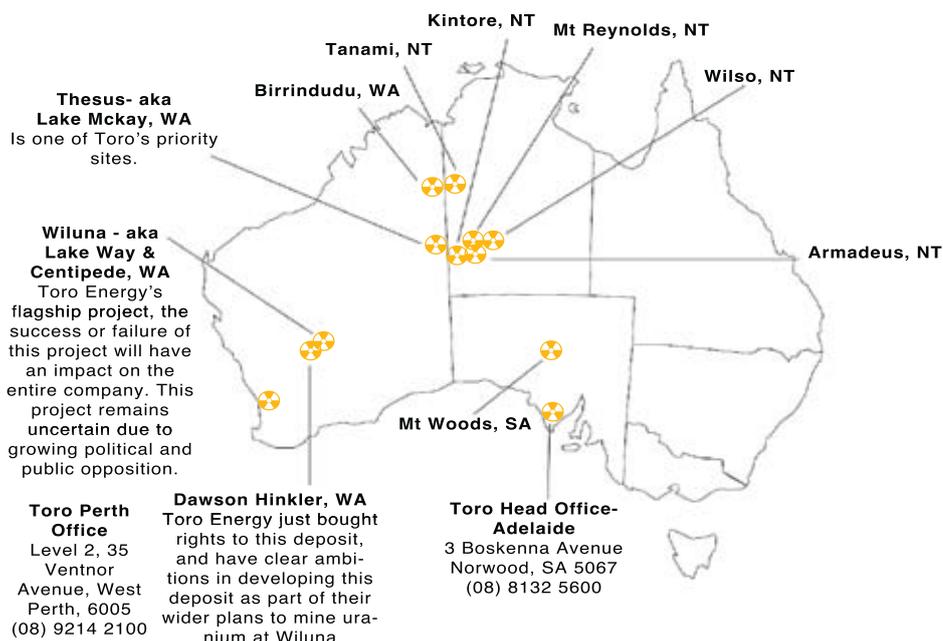
# TORO ENERGY LTD

The Wiluna project incorporates the Lake Way and Centipede uranium deposits and a number of surrounding low grade calcrete uranium deposits. There are no calcrete uranium mines in Australia and only one active calcrete uranium mine world-wide, at Langer Heinrich in Namibia. This mine, owned by Perth based Paladin Energy, has had ongoing problems with mineral processing.

Toro has uranium exploration projects in WA, SA, NT and Namibia but has no operating uranium mines and no experience in mining as a company. Some directors and senior staff have experience at the Ranger (NT) or Olympic Dam (SA) uranium operations, both of these projects have been plagued with license breaches, leaks and accidents. Olympic Dam has a chequered past with the establishment of the Roxby Downs Indenture Act which gave Western Mining Corporation, and now BHP Billiton, wide ranging legal exemptions from a series of South Australian laws including the Aboriginal Heritage Act, the Mining Act, the Water Act and the Freedom of Information Act.

The Ranger uranium mine is in an enclave inside Kakadu National Park. The mine is Australia's longest running uranium operation and has been a live issue in the Northern Territory for over 30 years with the Mirarr Traditional Owners and wider community. There have been over 150 documented leaks and license breaches at Ranger.

Given that these mines have all had serious adverse environmental and social impacts the involvement of Toro staff and directors provides scant confidence or comfort.



# PROPOSED WILUNA URANIUM MINE

The proposed Wiluna uranium mine is on the Lake Way playa system which rolls from mulga and accacia shrublands, to samphires, sand dunes and spinifex plains. It is home to a number of unique and endemic groundwater dependent plants and animals. The project includes the Lake Way and Centipede deopsits, Lake Way - 15km from the township of Wiluna and Centipede about 35km. Wiluna is in the East Murchison region of Western Australia about 600 kilometres north of Kalgoorlie.

Toro Energy submitted its Environmental Review Management Plan (ERMP) for the proposed Wiluna uranium mine to the WA Environment Protection Agency (EPA) in early 2011.

There were 2,196 submissions made to the Environment Protection Agency regarding Toro's Wiluna uranium proposal with the overwhelming majority (over 2,000) of these expressing opposition to the project.

The ERMP that Toro submitted to the EPA for assessment was at best a preliminary document with key studies, data and management plans missing. Much of that information has been provided incrementally to the EPA but is not in the public domain. The EPA made a recommendation to approve the mine without any significant environmental conditions, without a number of essential management plans and siting economic incentives for an early approval. The EPA approval recommendation was actively contested with nine formal appeals.

Due to a high level of support from the current pro uranium mining Government in WA, Toro have been walked through the assessment process and has achieved State environmental approval, but not the full set of required WA approvals. There are still large quantities of information, management plans and data required for federal approval and there are growing grounds for legal challenge from environment groups.

Toro has a number of further procedural hurdles. In March 2013 there will be a West Australian state election and while the current Liberal National Government supports uranium mining, WA Labor and the Australian Greens do not. The lack of bipartisan political support for uranium mining is significant and the Wiluna project WA faces continuing strong public and political opposition.



# PROPOSED WILUNA URANIUM MINE

## Specific concerns with Toro's Wiluna mine application (ERMP) include:

- Wiluna is in a remote area with very little infrastructure. To get uranium from Wiluna to a port licensed to ship uranium is a journey of 2,698 kms to Adelaide or 5,148 kms to Darwin. Transport plans are presented as a preliminary draft and yet the company plans to transport a toxic and radioactive product many thousands of kilometres from Wiluna to Adelaide and/or Darwin.
- Toro Energy has no proven corporate experience in mining.
- Toro have found a new and possibly endemic samphire species - Tecticornia, but have not done any impact assessment on the plant and therefore not properly identified the species. The Department of Environment and Conservation have warned that the project should not be approved without proper and complete studies on the species.
- Lake Way is home to a unique population of Stygofauna – a newly-discovered species of subterranean crustaceans.
- The mine rehabilitation plans are incomplete and Toro's preliminary costing for rehabilitation remains unclear and unpublished. This is clearly inconsistent with industry best practise and community expectation.
- Uranium mining and tailings disposal in this region would occur below the watertable and be connected to aquatic ecosystems. There is a risk of contaminating the aquatic ecosystems with changes in water chemistry, including the mobilisation of radioactive compounds.
- Toro plans to line the sides of the tailings pits (former shallow open pits) but not the base of the pit. Such an approach would lead to increased movement and leakage of radioactive mine tailings. In early 2012 a WA Government report into uranium mine regulations found that State tailings guidelines were outdated and flawed.
- The legal requirement for tailings management at the Ranger uranium mine in the NT is effective isolation for a period of not less than 10,000 years. This requirement was also passed as a motion in the Legislative Council in the West Australian Parliament in March 2012. This requirement should be a minimum standard for any proposed uranium mine in WA, including Wiluna.
- No calcrete uranium deposit has been mined in Australia and there is only one calcrete deposit presently being mined worldwide - Langer Heinrich - a mine that has been plagued with problems. There is a lack of expertise and experience in engineering and mine design for these deposits and they require complex and costly mineral processing techniques.



# TORO ENERGY LTD

- Toro has not factored in recent advice from the International Commission on Radiological Protection that radon is twice as carcinogenic<sup>1</sup> as previously thought. Toro has irresponsibly promoted the fringe scientific view that low-level radiation is harmless or beneficial; conversely, the company has done nothing to promote the mainstream scientific understanding that even low doses of ionising radiation can increase the incidence of severe and adverse health impacts, including fatal cancers and other diseases.
- Toro has not demonstrated a comprehensive understanding or analysis of the cumulative impacts of water extraction for the proposed mine.
- Toro have only identified and done impact assessment on water for the first seven years of the project which has a planned life of 14 years.
- Toro has made the false assumption that the Wiluna region has naturally elevated radiation levels and has failed to submit accurate and complete evidence on the radiological environment at Lake Way and its surrounds.
- Toro have not submitted a complete transport management plan but identifies it will need to transport uranium oxide between 2,698km to 5,148km's to the nearest licensed port. This is an enormous distance with significant risks an involving unwilling communities.
- Toro acknowledges the need for a formal risk assessment in relation to security risks, however this has not been carried out.
- A mining agreement with Traditional Owners has not yet been negotiated and the Heritage Mapping Survey which will inform negotiations has not yet been completed.
- There are local community concerns and complaints about the way Toro has scheduled and conducted public meetings and consultation processes. During the project's public consultation period Toro organised one community meeting in Wiluna. This coincided with a funeral. The funeral date was made before the Toro public consultation date was set however Toro declined to change its meeting date. This shows either a very poor understanding of the local community and a disturbing lack of sensitivity or it was an attempt to limit genuine public engagement in Wiluna. Toro refused to hold another meeting, instead choosing to organise a closed meeting with a few people the company has been negotiating with.

These issues have been raised with the Federal Environment Minister and the Department of Environment. Given the lack of complete studies and management plans it is unlikely the Federal assessment process will proceed without the need for substantial amounts of new information. It is unlikely that Toro will receive Federal approval in 2012.



# PROPOSED WILUNA URANIUM MINE

## HISTORICAL PROBLEMS AT WILUNA

Uranium exploration in the Wiluna region in the 1980s left a legacy of pollution and contamination. Radiation levels more than 100 times normal background readings have been recorded despite the area being 'cleaned' a decade ago.

Even after the 'clean up' the site was left with rusting drums containing uranium ore and deficient institutional control and signage. In one case a sign reading "Danger – low level radiation ore exposed" was found lying face down in bushes.

Following a site inspection in 2000 WA Greens parliamentarian Robin Chapple stated:

*"We found corroded drums of radioactive ore, piles of uranium ore and remnants of wire netting and fence posts. We found some of the most toxic material just being left to blow in the breeze."*

In August 2000 the coordinator of the Wiluna-based Maruwayura Aboriginal Corporation Steve Syred said that until about 1993 around 100 to 150 people were living at an old mission three kilometres from the spot where high radiation levels were recorded. Mr. Syred told the Kalgoorlie Miner newspaper that the Aboriginal community had unsuccessfully resisted uranium exploration in the area in the early 1980s.

Since this time many people had lived in the area while the Ngangganawili Aboriginal Corporation was based near the site and Elders still hunted in the area.



Corroded drums from uranium exploration in the 1980s.



# THE BARRIERS TO AN EXPANSION OF NUCLEAR POWER

## URANIUM PRICE

The global uranium market has been in a state of free fall and remains highly vulnerable to external influences. The price fall that has followed the Fukushima crisis is unlikely to be dramatically reversed because of the renewed public opposition to the industry and the increased scrutiny of the sector's performance that has revealed that "without Governments private companies would simply not choose to buy nuclear reactors".<sup>2</sup>

There are a lot of uranium miners out there selling these "failed dreams" to support their efforts to raise capital. The reality does not support investment in uranium mining. Paladin Energy, a Perth based uranium miner has made public comment that it would not start any projects or expand projects unless the uranium price went back to \$85.<sup>3</sup> The uranium price in November 2012 was at US\$40. Canadian uranium miner Cameco made a similar announcement but put the minimum required price at \$65 as they pulled back from the Kintyre project in WA - a significantly larger and higher grade deposit than Toro's Lake Way and Centipede deposits.<sup>4</sup>

Toro has been reported in the media with comments such as: "Toro Energy says plans to restart Japan's nuclear reactors, after they were shut down following last year's Fukushima nuclear accident, should help boost uranium prices."<sup>5</sup>

This view is overly optimistic and does not reflect the sentiments of investors. Many of the reactors in Japan that have closed post Fukushima will never reopen and the remains strong community support for an end to nuclear power in Japan.



The demand in uranium has been affected by Japan and other countries reducing their nuclear programs, and by the forced stockpiling of uranium in Japan. In turn the impact of the fall in demand has led to a fall in price.

information from [www.indexmundi.com/commodities](http://www.indexmundi.com/commodities)



# THE BARRIERS TO AN EXPANSION OF NUCLEAR POWER

## URANIUM MINERS RETURNING NOTHING BUT LOSS

Despite Paladin achieving record production, and securing US\$52 a pound for uranium (relatively good given the volatility of the uranium price over the last year) the company still managed a record \$173million loss.<sup>6</sup>

The Paladin Energy experience should be a lesson for the smaller uranium players and hopefuls like Toro Energy. Australia's uranium sector is dominated by major multi-national miners with BHP Billiton and Rio Tinto controlling around 90% of production in Australia. The remainder is produced by the secretive US based General Atomics.

Despite mining giant status, Energy Resources Australia, a subsidiary of Rio Tinto also reported record losses from its Ranger uranium mine in the Northern Territory. Recently ERA reported a \$154 million loss<sup>7</sup> for 2011 and a further half year loss of \$59.86million<sup>8</sup> at July 2012. Big or small now is a bad time to be in the business of uranium.

Other developments in the past two years that highlight the uncertainty and obstacles that characterise the uranium sector include:

- ERA abandoned plans for heap leach uranium mining at Ranger due to Traditional Owner and stakeholder opposition
- Plans for uranium mining at Arkaroola in SA have been stopped due to environmental sensitivities associated with the Arkaroola Wilderness Sanctuary
- Kintyre and Yeelirrie - planned development at WA's biggest uranium deposits, now both held by the worlds biggest uranium miner Cameco, have been put on hold due to the low uranium price
- The Olympic Dam Uranium mine expansion has been put on hold indefinitely - this deposit is the largest uranium deposit in Australia by the world's biggest miner - BHP Billiton. In announcing the project deferral earlier this year BHP Billiton CEO Marius Kloppers referred directly to the uncertainty in the global uranium market.

Despite all the hype uranium continues to contribute just 0.3 percent of Australia's export revenue and the industry accounts for just 0.021 percent of employment in Australia. The Australian uranium sector employs less than 650 people and generates around \$600 million in exports - the sector large risks and low rewards. The sector brings large risks and low rewards. When things go wrong in the nuclear industry they go seriously wrong for everyone - from local communities to investors, shareholders and business.



# THE BARRIERS TO AN EXPANSION OF NUCLEAR POWER

## INVESTMENT RISKS

Toro commissioned 'Independent Investment Research'<sup>9</sup> to review the company's operations and ambitions. Their report identified continuing difficulties facing Toro including:

### **Weakness**

- *No production history*
- *Still needs Federal Government Approval*
- *Very high regulatory requirements for uranium mining compared to other commodities*
- *With global financial weakness raising capital could be difficult*

### **Threats**

- *Given the high leverage to the uranium market, a fall in uranium prices will have an adverse impact on the company's revenue once producing or in the event of a significant and sustained fall in prices may render the Project uneconomical to develop*
- *Increasing construction and mining costs due to labour shortages in WA*
- *Another disaster like Fukushima will have a significant impacts on the nuclear industry*

There are a number of other threats to the project that have not been highlighted by this research. Political and public opposition - over 15,000 signatures to ban uranium mining in WA have been tabled in Parliament. The WA Labor party maintain their opposition to uranium mining and the Australian Greens are actively and directly challenging Toro.

The research has failed to identify that Japan is stockpiling uranium that they don't need and the decrease in nuclear reactors and demand. They have however overstated a future shortfall in uranium which conveniently ignores multiple new uranium projects in Canada and Africa.

Any new nuclear power reactors that come online in the next 4 years (the time frame Toro estimate a supply demand) will most likely already have identified uranium supplies and made sales deals. It is naive for Toro to think that these companies involved in building these reactors have not already secured uranium supply - considering they are prepared to spend billions on building a reactor that on average will have a life of 60+ years over four times the life of the proposed Wiluna mine.

Fukushima continues to be a threat to the nuclear industry as it has shown how volatile and vulnerable the industry is. It has also awakened a new resistance to the energy source and seen increase regulatory and compliance costs. With the growth of renewable energy providing a safe alternative to coal it is unlikely nuclear power will ever recover to pre Fukushima levels.



# URANIUM AND HEALTH

## TORO PROMOTES DANGEROUS JUNK SCIENCE

Toro Energy has facilitated several visits to Australia by the Canadian scientist Dr Doug Boreham to present the fringe scientific view that radiation is beneficial to human health.

Toro's active promotion of such a marginal scientific view directly undermines the company's credibility. Toro has failed to present the mainstream scientific view that even the smallest radiation doses can cause an increase the likelihood of fatal cancers and other diseases.

Toro's role in funding such speaking tours further calls into question its commitment to occupational health and safety (OHS) standards. If the company really believes that low level radiation is harmless or even beneficial, then by its own dangerous logic it is unlikely to have a strong radiation protection culture or to apply best radiation protection measures.

Dr Peter Karamoskos – a nuclear radiologist and a public representative on the radiation health committee of the federal nuclear regulator, the Australian Radiation Protection and Nuclear Safety Agency – states:<sup>10</sup>

*“To promote such marginal views without any counter-balance is self-serving and irresponsible and it may be time for governments to step in to provide that balance. Recent research has heightened rather than lessened concern about the adverse health impacts of low-level radiation.”*

In April 2011 Dr Karamoskos wrote<sup>11</sup>

*“There seems to be a never-ending cabal of paid industry scientific “consultants” who are more than willing to state the fringe view that low doses of ionising radiation do not cause cancer and, indeed, that low doses are actually good for you and lessen the incidence of cancer. Canadian Dr Doug Boreham has been on numerous sponsored tours of Australia by Toro Energy, a junior uranium explorer, expounding the view that “low-dose radiation” is like getting a suntan. Toro must have liked what it heard because it made him a safety consultant for the company in 2009.*



# URANIUM AND HEALTH

*Ionising radiation is a known carcinogen. This is based on almost 100 years of cumulative research including 60 years of follow-up of the Japanese atom bomb survivors. The International Agency for Research in Cancer (IARC, linked to the World Health Organisation) classifies it as a Class 1 carcinogen, the highest classification.*

In 2006 the US National Academy of Sciences released its Biological Effects of Ionising Radiation (BEIR) report, which focused on the health effects of radiation doses at below 100 millisieverts. This was a consensus review that assessed the world's scientific literature on the subject at that time. It concluded: *"there is a linear dose response relationship between exposure to ionising radiation and the development of solid cancers in humans. It is unlikely that there is a threshold below which cancers are not induced."*

The most comprehensive study of nuclear workers by the IARC, involving 600,000 workers exposed to an average cumulative dose of 19mSv, showed a cancer risk consistent with that of the A-bomb survivors.

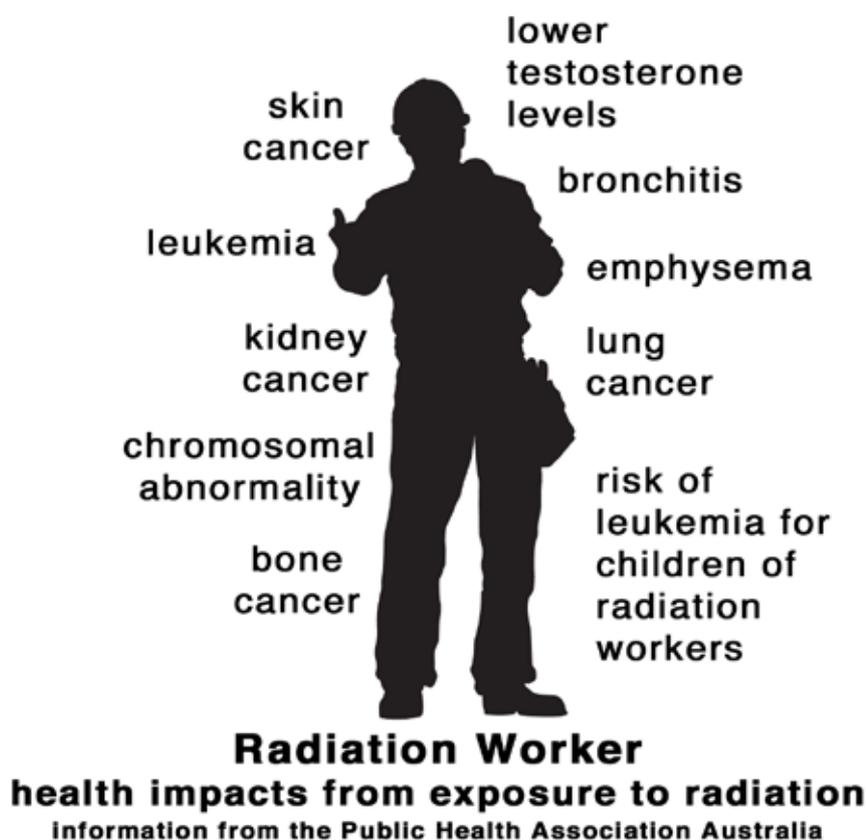
Toro's perspective is in clear conflict with the mainstream scientific view regarding low-level radiation, including:

The 2005 report of the Committee on the Biological Effects of Ionising Radiation (BEIR) of the US National Academy of Sciences states that: *"The Committee judges that the balance of evidence from epidemiologic, animal and mechanistic studies tend to favour a simple proportionate relationship at low doses between radiation dose and cancer risk."* The report further 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."*<sup>12</sup> On the theory that low-level radiation is beneficial (Hormesis), the report states: *"The committee concludes that the assumption that any stimulatory hormetic effects from low doses of ionizing radiation will have a significant health benefit to humans that exceeds potential detrimental effects from the radiation exposure is unwarranted at this time."* An appendix to the report deals with the theory of hormesis in some detail.



# URANIUM AND HEALTH

- A study published in the Proceedings of the National Academy of Sciences (US) in 2003 concluded that *“the most reasonable assumption is that the cancer risks from low doses - decrease linearly with decreasing dose. 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.”*<sup>13</sup>
- And to give one other example (there are many), the most recent (2010) review of the United Nations Scientific Committee on the Effects of Atomic Radiation states that: *“Radiation can simultaneously damage both strands of the DNA double helix, often resulting in breakage of the DNA molecule with associated complex chemical changes. This type of complex DNA damage is difficult to repair correctly, and even at low doses of radiation it is likely that there is a very small but non-zero chance of the production of DNA mutations that increase the risk of cancer developing. Thus, 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 do*



# THE BARRIERS TO AN EXPANSION OF NUCLEAR POWER

***“Those suffering from nuclear amnesia have forgotten why nuclear power faded from the energy scene in the first place, how many times it has failed to deliver, how often it has disappointed it’s most determined advocates, how extravagantly it has squandered unparalleled, unstinting support from taxpayers around the world, leaving them with burdens that may last for millennia.”***

Peter Bradford, former US Nuclear Regulatory Commissioner<sup>15</sup>

While the debate on nuclear power is often focused on weapons and waste there are many other barriers to this industry including high capital intensity and costs, regulatory restraints and costs, a shortage of skilled labor to build and operate new plants, insurance arrangements, infrastructure and production bottlenecks and the availability of finance.<sup>16</sup>

In March 2012 The Economist magazine branded the nuclear industry as “The dream that failed”<sup>17</sup> stating that “The lights are not going off all over Japan, but the nuclear power plants are. Of the 54 reactors in those plants, with a combined capacity of 47.5 gigawatts, only two are operating today”. Soon after that comment there was a period where there was not a single operating nuclear reactor in Japan.

As of November 2012 there are only 2 operating reactors in Japan. The restart of these 2 reactors in July 2012 led to unprecedented protests in Japan which caused the President to announce a phase out of all nuclear power by 2030. This position is being challenged by industry and defended by huge community opposition and public protest.

Since the Fukushima disaster a number of countries have scaled back or began to phase out their nuclear power programs including Italy, Germany, Switzerland, Belgium and Kuwait. A poll taken in Japan in March by the Japan Association for Public Opinion Research found 80% of people were in favour of phasing out nuclear power.<sup>18</sup>

The cost of nuclear power is greatly increased when the impacts of disasters are factored in. The Fukushima clean up is set to cost approximately \$250 billion.<sup>19</sup> A 2011 UN report on the disaster found that it had caused “hundreds of billions of dollars of property damage”.<sup>20</sup>

There have been hundreds of accidents and incidents at power stations, research reactors, mine sites, enrichment facilities, transportation, nuclear medicine, nuclear waste, nuclear weapons, nuclear submarines and there have been security breaches and terrorist attacks on nuclear facilities.<sup>21</sup>



# THE BARRIERS TO AN EXPANSION OF NUCLEAR POWER

## COSTS OF NUCLEAR POWER

Nuclear power was always promoted as energy *'to cheap to meter,'* and yet *"Nuclear plants are getting ever more expensive."*<sup>22</sup> In the US there is an actively pro nuclear Government,<sup>23</sup> offering loan guarantees to five (now four) new reactors but none of these projects have secured finance thwarting any plans to proceed. It is unlikely these new reactors in the US will be built due the high costs, inability to secure finance, cost blow outs and delays. Far from being too cheap to meter it is far more likely that nuclear energy will prove too expensive to matter.

The newest reactors to be approved in the US - the first to be approved since the Three Mile Island disaster in 1979 - are estimated to cost \$20 billion to build, equating to \$9,000 per kW.<sup>24</sup> Some existing reactors while not quite as expensive still cost between \$1,700 and \$5,400 per kW of capacity. To put this in perspective wind turbines cost roughly \$3,000 to \$5,000 per kW of capacity, on average wind facilities are built for 2MW capacity at a cost of \$3.5 million.<sup>25</sup>

## WHAT DO FINANCIAL INSTITUTIONS SAY ABOUT NUCLEAR POWER?

Ernst & Young commented in a report in 2010 before the Fukushima disaster, *'It is hoped that the nuclear industry has learned its lessons from the extensive cost overruns and schedule delays that characterized the 1970's and 1980's and cost the US industry billions of dollars in failed rate recoveries and losses. However, current data suggests that many new projects are not faring much better.'*<sup>26</sup>

Standard and Poors, in a review of the economics of US nuclear power stated *"We expect unregulated companies, which are sponsoring new nuclear projects and which do not receive loan guarantees, will defer or abandon them altogether because it's too expensive, or uneconomic, to build them without such guarantees."*<sup>27</sup>



# THE BARRIERS TO AN EXPANSION OF NUCLEAR POWER

## GLOBAL INDUSTRY

There are currently 436 reactors in operation world-wide, thirty three of which were constructed over forty years ago.<sup>28</sup> (this figure does not reflect the reactors that have come off-line in Japan).

Of the 63 reactors listed with the International Atomic Energy Agency as 'under construction'; 12 have been listed as under construction for over 20 years, 35 do not have an official start up date and many others have already had construction delays. Forty-seven of the projects listed are located in just four countries; Russia, China, India and South Korea<sup>29</sup> – all with different but significant issues with transparency, democracy, weapons proliferation and safety. Nuclear power will "*become less and less a creature of democracies*" as the Economist suggests.<sup>30</sup>

In the most recent 'World Nuclear Industry Status Report' it's suggested that 191 reactors would need to be built in the next 19 years to maintain status quo.<sup>31</sup> That's one every 37 days. If you consider that there are 59 reactors world-wide under construction and that a significant number of those have been in construction for around 20 years and have experienced significant delays and cost overruns, it is not credible that this kind of reactor build could occur.

The 2012 World Nuclear Industry Status report concludes that:<sup>32</sup>

- Four countries announced they would phase out nuclear power - Belgium, Germany, Switzerland and Taiwan (not including the Japan announcement) and five countries would not engage or re-engage in nuclear programs - Egypt, Italy, Jordan, Kuwait and Thailand. There was only one new country to engage in a nuclear power program - Iran, which has been heavily opposed by Israel and the US
- There were seven reactors that started and 19 reactors closed.
- In Bulgaria and Japan two reactors under construction were abandoned
- Construction began on two reactors
- In Brazil, France, India and the US new build projects were cancelled. In the Netherlands, the UK and the US key utilities withdrew support leaving projects in jeopardy
- There have also been delays on a number of projects that were due to begin construction - most notably in China where not a single new construction site opened.
- Of 28 reactor license application 16 were delayed and 8 were suspended or officially cancelled. Two construction licenses were issued
- Of the 59 reactors under construction world wide - 18 are experiencing delays
- 43 projects do not have an IAEA start up date
- Construction costs at a number of projects are significantly over budget
- Of eleven assessed nuclear companies and utilities - seven were downgraded by credit rating agency Standard and Poor over the last 5 years. Four companies remained stable and none were upgraded over the same 5 year period
- Over the last five years TEPCO lost 96% of its share value, the world's largest nuclear operator - EDF lost 82% of their value and AREVA fell by 88%.



# THE BARRIERS TO AN EXPANSION OF NUCLEAR POWER

If reactors are operated for 40+ years, safety problems and accidents will inevitably arise. A 2012 IAEA Nuclear Safety Review highlights safety concerns of an ageing nuclear reactor fleet “with many of them exceeding their original design life”. The IAEA Review said: “There are growing expectations that older nuclear reactors should meet enhanced safety objectives, closer to that of recent or future reactor designs. There is a concern about the ability of the ageing nuclear fleet to fulfill these expectations.”<sup>33</sup>

A June 2011 Associated Press investigative report states:

*“Time after time, officials at the U.S. Nuclear Regulatory Commission have decided that original regulations were too strict, arguing that safety margins could be eased without peril, according to records and interviews. The result? Rising fears that these accommodations by the NRC are significantly undermining safety - and inching the reactors closer to an accident that could harm the public and jeopardize the future of nuclear power in the United States.*

*Examples abound. When valves leaked, more leakage was allowed - up to 20 times the original limit. When rampant cracking caused radioactive leaks from steam generator tubing, an easier test of the tubes was devised, so plants could meet standards.*

*Failed cables. Busted seals. Broken nozzles, clogged screens, cracked concrete, dented containers, corroded metals and rusty underground pipes - all of these and thousands of other problems linked to aging were uncovered in the AP's yearlong investigation. And all of them could escalate dangers in the event of an accident.*

*Yet despite the many problems linked to aging, not a single official body in government or industry has studied the overall frequency and potential impact on safety of such breakdowns in recent years, even as the NRC has extended the licenses of dozens of reactors.*

*Industry and government officials defend their actions, and insist that no chances are being taken. But the AP investigation found that with billions of dollars and 19 percent of America's electricity supply at stake, a cozy relationship prevails between the industry and its regulator, the NRC.*

*Records show a recurring pattern: Reactor parts or systems fall out of compliance with the rules. Studies are conducted by the industry and government, and all agree that existing standards are ‘unnecessarily conservative’.*

*Regulations are loosened, and the reactors are back in compliance.’<sup>34</sup>*



# NUCLEAR POWER AND NUCLEAR WASTE

Toro promotes further misinformation regarding uranium mining and the nuclear fuel cycle. Some examples include:

## NUCLEAR WASTE

- Toro talks about the “recycling” of spent nuclear fuel.<sup>35</sup> In fact reprocessing results in considerable releases of radioactive materials.<sup>36</sup> It is “*environmentally dirty*” according to the Deputy Director General of the World Nuclear Association.<sup>37</sup>
- Toro falsely claims that ‘most spent nuclear fuel is rehandled or reprocessed’. About one-third of spent fuel is reprocessed – very little of the separated uranium is reused (or ‘recycled’) and stockpiles of separated, weapons-useable plutonium continue to grow.
- Toro falsely claims that “many countries treat spent fuel as a resource for future recycling.” In fact spent nuclear fuel is a growing environmental management problem with many countries keen to dump their nuclear waste in Australia or anywhere else that will take it.<sup>38</sup>
- Toro falsely claims that “*many countries have advanced internationally co-operative, nuclear waste management strategies that aim to leave no legacy for future generations.*”
- Toro falsely claims that: “*Nuclear power is the only electricity production technology that takes full responsibility for its waste products.*” There are radiation releases to the environment from most stages of the nuclear fuel cycle. Future generations will have to manage waste legacies such as uranium tailings and spent fuel for centuries or millennia. On many occasions the nuclear industry attempts to offload responsibility for nuclear waste by dumping it on the land of Indigenous communities; Winona LaDuke, Native American economist and writer, said at the Indigenous World Uranium Summit in 2006 that: “*The greatest minds in the nuclear establishment have been searching for an answer to the radioactive waste problem for fifty years, and they’ve finally got one: haul it down a dirt road and dump it on an Indian reservation*”.



# NUCLEAR POWER AND NUCLEAR WASTE

Toro trivialises and ignores waste streams across the nuclear fuel cycle. Here are the figures for the operation of just one (1GW) reactor for one year:

- 720,000 tonnes of radioactive tailings waste (assuming the uranium is sourced from Olympic Dam)
- 170 tonnes of depleted uranium waste
- 30 tonnes of high-level nuclear waste (spent fuel)
- 300 cubic metres of low-level and intermediate-level waste.

If Australia was to operate 25 reactors over a 50-year lifespan, the following waste streams would be generated:

- 900 million tonnes of low-level radioactive tailings waste.
- 215,000 tonnes of depleted uranium waste
- 37,500 tonnes of high-level nuclear waste (spent fuel).
- 375,000 cubic metres of low-level and intermediate-level waste.

Toro Energy Ltd proposes exporting a total of about 16,800 tonnes of uranium oxide (14 years x 1200 t/yr). This would result in the production of:

- 2520 tonnes of high-level nuclear waste (i.e. spent nuclear fuel)<sup>39</sup>
- 25.2 tonnes of plutonium, sufficient for 2520 plutonium bombs similar to that which destroyed Nagasaki in 1945.<sup>40</sup>

Toro states that it has “initiated sales discussions with potential customers”. There is a clear public interest issue associated with this statement.

Is Toro planning to sell uranium to nuclear weapons states? To countries blocking the Comprehensive Test Ban Treaty and the Fissile Material Cut-Off Treaty? To undemocratic, secretive or repressive states or countries that have not even signed the Nuclear Non Proliferation Treaty?

Toro has indicated they are interested in selling uranium to India. However India refuses to sign the Comprehensive Test Ban Treaty, is outside the Nuclear Non Proliferation Treaty (NPT) framework, is actively producing fissile material for weapons and is actively expanding its arsenal of nuclear weapons as well as its delivery capabilities.



# NUCLEAR POWER AND NUCLEAR WASTE

## FUKUSHIMA

Many nuclear advocates are seeking to downplay the extensive impacts of the continuing Fukushima disaster and to absolve the plant operator, the Tokyo Electric Power Company (TEPCO), from any responsibility for the March 2011 disaster – instead solely blaming natural events, namely the earthquake and tsunami.<sup>41</sup> A clear example is provided by Toro Energy: “It was therefore a sequence of extraordinary forces unleashed by an unprecedented natural disaster which caused the accident at the reactors, not any operating failure, human error or design fault of the reactors themselves.”<sup>42</sup>

Those claims do not stand up to scrutiny. The Japanese government’s Investigation Committee found that TEPCO’s preparations for and protections against a disaster were “quite inadequate”, tsunami risks were “grossly underestimated”, and the nuclear disaster prevention program had “serious shortfalls”.<sup>43</sup> The Fukushima disaster has further exposed long-standing patterns of corruption and collusion in Japan’s nuclear industry.<sup>44</sup>

Culpability also lies with the many overseas organisations that have helped to construct, supply and service Japan’s nuclear power industry and have done little or nothing about the recurring patterns of safety breaches, cover-ups, demonstrably inadequate regulation and so on. Those suppliers include companies operating uranium mines in Australia.

Australia’s uranium industry did nothing as TEPCO lurched from scandal to scandal and accident to accident over the past decade. It did nothing in 2002 when it was revealed that TEPCO had systematically and routinely falsified safety data and breached safety regulations for 25 years or more. The industry did nothing in 2007 when over 300 incidents of “malpractice” at Japan’s nuclear plants were revealed. It did nothing even as the ability of Japan’s nuclear plants to withstand earthquakes and tsunamis came under growing criticism from industry insiders and independent experts. It did nothing about the multiple conflicts of interest plaguing the Japanese nuclear ‘regulator’. Australian Government and Industry response following Fukushima has been deficient, irresponsible and driven by self interest.

It should not be forgotten that Australian uranium – rock dug from South Australia and the Northern Territory was inside the reactors at Fukushima and is now spreading as fallout in Japan and beyond. On the 31st of October 2011 a senior Australian government official reported to Parliament that:

***“Australian obligated nuclear material was at the Fukushima Daiichi site and in each of the reactors- maybe five out of six, or it could have been all of them; almost all of them”.***<sup>45</sup>



# NUCLEAR POWER AND NUCLEAR WASTE

Public opposition to nuclear power has dramatically strengthened around the world since the Fukushima melt-down and this will continue to have a direct and material impact on the social license and profitability of Australian uranium operations.

Toro will not acknowledge TEPCO's obvious culpability for the Fukushima nuclear disaster let alone the (lesser) culpability of contractors and suppliers who turned a blind eye to serious problems over many years.

This approach raises deep concerns that should Toro become a uranium exporter it would turn a blind eye to serious problems in uranium customer countries and utilities, just as the other uranium companies have.

Toro claims that it *"is now believed that no member of the public was exposed to any harmful levels of radiation"* from Fukushima and that radiation releases *"are not expected to impact the health of the broader public."* Those statements are false.

One preliminary estimate is that Fukushima will result in *"around 1000"* fatal cancers.<sup>47</sup> Another preliminary estimate is *"~100s cases"* of fatal cancers.<sup>48</sup> The long term cancer death toll may rise significantly if large numbers of people resettle in contaminated areas.



Evacuation point - police patrol Fukushima exclusion zone July 2011



# APPENDIX: RADIATION RISKS TO URANIUM MINERS

## **Nuclear Radiologist Dr Peter Karamoskos**

This is an excerpt from the detailed, referenced paper posted at [www.choosenuclearfree.net/health](http://www.choosenuclearfree.net/health)

The link between uranium mining and lung cancer has long been established. Certain groups of underground miners in Europe were identified as having increased mortality from respiratory disease as early as the 16th century. Lung cancer as the cause was not recognised until the 19th century. The radioactive gas, radon, was identified as the cause in the 1950's. Studies of underground miners, especially those exposed to high concentrations of radon, have consistently demonstrated the development of lung cancer, in both smokers and non-smokers. On this basis, the International Agency for Research on Cancer (IARC) classified radon as a carcinogen in 1988. In 2009, the ICRP stated that radon gas delivers twice the absorbed dose to humans as originally thought and hence is in the process of reassessing the permissible levels. At this stage, however, previous dose estimates to miners need to be approximately doubled to accurately reflect the lung cancer hazard.

The Biological Effects of Ionising Radiation VI report (1999) reviewed eleven cohort studies of 60,000 underground miners with 2,600 deaths from lung cancer, eight of which were uranium mines in Europe, North America, Asia and Australia. These found a progressively increasing frequency of lung cancer in miners directly proportional to the cumulative amount of radon exposure in a linear fashion. Smokers had the highest incidence of lung cancer, as would be expected, however, the greatest increase in lung cancer was noted in non-smokers. The highest percentage increase in lung cancer was noted 5-14 years after exposure and in the youngest miners.

Uranium miners are also exposed to IR [ionising radiation] directly from gamma radiation and the dose from this is cumulative to that from radon. At the Olympic Dam underground uranium mine, the total dose per miner is approximately 6mSv, of which 2-4 mSv (allowing for the new ICRP dose coefficients) are due to radon and the balance due to gamma radiation.

Most modern uranium mines have air extraction systems and monitored ambient measures of radon concentrations to ensure levels remain low. Current levels of radon in underground uranium mines are only a fraction of mines over one hundred years ago. Furthermore, miners are given personal protective equipment (PPE) including masks to filter out the radioactive particulate matter. However, many underground miners find the masks extremely uncomfortable, especially in the hot underground environment they must contend with.



# APPENDIX: RADIATION RISKS TO URANIUM MINERS

It is estimated that up to 50% of underground uranium miners in Australia do not use their masks, and thus drastically increase their risk of lung cancer, whilst underestimating their actual radiation dose (since this is calculated assuming PPE's are used).

The Olympic Dam doses mentioned above are typical of modern mine practices. The average miner at Olympic Dam is in his twenties and stays on average five years at the site. A typical calculation using the linear no threshold model and the latest BEIR-VII figures of radiation carcinogenesis risks indicates miners at Olympic Dam therefore have a 1:420 chance of contracting cancer, most likely lung cancer. Note that as the research demonstrates risk of developing lung cancer is greater for younger workers. These risks are not insubstantial. Radiation safety and risk principles can be quite complex and it is debatable whether miners have the training to understand the basis of such risks, or are even informed of these risks in a comprehensive and accurate manner that they can comprehend and make an informed work decision.



# REFERENCES AND LINKS

- 1 ICRP [www.icrp.org/docs/ICRP\\_Statement\\_on\\_Radon\(November\\_2009\).pdf](http://www.icrp.org/docs/ICRP_Statement_on_Radon(November_2009).pdf)
- 2 The Economist, March 10-16th 2012. Pg 15 of the special report.
- 3 <http://www.wabusinessnews.com.au/article/Paladin-books-US173m-loss-in-FY2012>
- 4 <http://www.theaustralian.com.au/business/uranium-prices-halt-sandy-desert-project/story-e6frg8zx-12264379652512>
- 5 Toro Energy [http://toroenergy.com.au/\\_literature\\_98826/Presentation\\_to\\_2012\\_Paydirt\\_Uranium\\_Conference](http://toroenergy.com.au/_literature_98826/Presentation_to_2012_Paydirt_Uranium_Conference)
- 6 Peter Ker, Paladin's cost cutting drive hits chemical glitch, The West Australian Business, 16th April 2012
- 7 Rick Hind, ABC, ERA takes bath over Ranger uranium delays February 01, 2012 <http://www.abc.net.au/news/2012-02-01/20120201-era-profit-fall-ranger-uranium/3804916>
- 8 <http://www.theaustralian.com.au/business/profit-loss/energy-resources-cuts-losses-to-60m-as-ranger-winds-down/story-fn91vch7-1226435536732>
- 9 Toro Investment research report <http://www.toroenergy.com.au/>
- 10 Online Opinion, 13 December 2010, [www.onlineopinion.com.au/view.asp?article=11358](http://www.onlineopinion.com.au/view.asp?article=11358) See also the detailed briefing paper posted at [www.choosenuclearfree.net/health](http://www.choosenuclearfree.net/health)
- 11 'Don't be fooled by the spin: radiation is bad', The Age, 8/4/11, <http://www.theage.com.au/opinion/society-and-culture/dont-be-fooled-by-the-spin-radiation-is-bad-20110407-1d63z.html>
- 12 Committee on the Biological Effects of Ionising Radiation (BEIR), US National Academy of Sciences, <http://www.nap.edu/books/030909156X/html>
- 13 <http://www.pnas.org/cgi/doi/10.1073/pnas.2235592100/>
- 14 [http://www.unscear.org/docs/reports/2010/UNSCEAR\\_2010\\_Report\\_M.pdf](http://www.unscear.org/docs/reports/2010/UNSCEAR_2010_Report_M.pdf)
- 15 Bradford, P. 'Nuclear Power and climate change', society of Environmental Journalists Panel Debate, Burlington, Vermont, October 27, 2006. Sourced from Froggart, A. Schneider, M. The World Nuclear Industry Status Report 2007, commissioned by the Greens EFA Group in the European Parliament, accessed online [http://www.greens-efa.org/cms/topics/dokbin/206/206749.the\\_world\\_nuclear\\_industry\\_status\\_report@en.pdf](http://www.greens-efa.org/cms/topics/dokbin/206/206749.the_world_nuclear_industry_status_report@en.pdf)
- 16 Nivola, Pietro.S, The political economy of nuclear energy in the United States, pg 5. The French Centre on the United States, CFE Policy Paper series, Governance studies program, The Brookings Institute, Washington, DC, May 2004.
- 17 The Economist, March 10-16th 2012. 14 page special report
- 18 Reuters Japan's majority favor phasing out nuclear power: poll, 18th March 2012, <http://news.yahoo.com/japans-majority-favor-phasing-nuclear-power-poll-041801621.html>
- 19 News on Japan, Fukushima cleanup could cost up to \$250 billion <http://newsonjapan.com/html/newsdesk/article/89987.php>
- 20 United Nations, study on the implications of the accident at the Fukushima Daiichi nuclear power plant, September 2011 - <http://www.un.org/sg/statements/index.asp?nid=5556>
- 21 <http://scott-ludlam.greensmps.org.au/let-the-facts-speak>
- 22 The Economist, March 10-16th 2012. Pg 12 of the special report.
- 23 US Department of Energy, Office of Nuclear Energy, <http://www.ne.doe.gov/>
- 24 The Economist, March 10-16th 2012. Pg 13 of the special report.
- 25 Windustry <http://www.windustry.org/how-much-do-wind-turbines-cost>
- 26 Ernst and Young Passing the starting line: nuclear construction risk [http://www.freshfieldsportal.com/inla/wp-content/uploads/2010/07/E-Y-report-Nuclear-construction-risk\\_Sep-102.pdf](http://www.freshfieldsportal.com/inla/wp-content/uploads/2010/07/E-Y-report-Nuclear-construction-risk_Sep-102.pdf)
- 27 Standard and Poors: [http://www.standardandpoors.com/ Why Is It So Much More Expensive To Build A Nuclear Power Plant In The U.S. Than Abroad? 16-Aug-2010](http://www.standardandpoors.com/Why_Is_It_So_Much_More_Expensive_To_Build_A_Nuclear_Power_Plant_In_The_U.S._Than_Abroad?_16-Aug-2010)
- 28 International Atomic Energy Agency, Power Reactor Information System (IAEA PRIS) <http://nucleus.iaea.org/sso/NUCLEUS.html?exturl=http://www.iaea.org/OurWork/ST/NE/NENP/index.html>.
- 29 Mycle Schneider, Anthony Froggatt, Steve Thomas, The World Nuclear Industry Status Report 2010-2011, Nuclear Power in a Post Fukushima World, World Watch Institute, June 2011, pg 14-15
- 30 The Economist, March 10-16th 2012. Pg 15



# REFERENCES AND LINKS

- 31** Mycle Schneider, Anthony Froggatt, Steve Thomas, The World Nuclear Industry Status Report 2010-2011, Nuclear Power in a Post Fukushima World, World Watch Institute, June 2011, pg 14-15
- 32** The World Nuclear Industry Status Report 2012 Mycle Schnieder <http://www.worldnuclearreport.org/>
- 33** Closing old atom plants poses safety challenge: IAEA, 24 March 2012, <http://mobile.reuters.com/article/idUSTRE72N6E420110324?feedType=RSS&ca=rdt>
- 34** Jeff Donn, 'AP study: U.S. nuclear regulators weaken safety rules' 19 June 2011, <http://www.pjstar.com/free/x1781765020/AP-study-U-S-nuclear-regulators-weaken-safety-rules> (correct reference and numbering)
- 35** [http://www.toroenergy.com.au/ur\\_waste.html](http://www.toroenergy.com.au/ur_waste.html)
- 36** [http://www.ucsus.org/nuclear\\_weapons\\_and\\_global\\_security/nuclear\\_terrorism/technical\\_issues/reprocessing-and-nuclear.html](http://www.ucsus.org/nuclear_weapons_and_global_security/nuclear_terrorism/technical_issues/reprocessing-and-nuclear.html)
- 37** <http://www.neimagazine.com/story.asp?sectionCode=147&storyCode=2023239>
- 38** <http://www.foe.org.au/anti-nuclear/issues/oz/import-waste>
- 39** 200 t UOX per reactor per year; 84 reactor-years; 30 t high-level waste per reactor per year
- 40** 84 reactor-years; 300 kg Pu per reactor per year; 10 kg plutonium per bomb
- 41** [http://cnic.jp/english/newsletter/nit143/nit143articles/fuku\\_deception.html](http://cnic.jp/english/newsletter/nit143/nit143articles/fuku_deception.html)
- 42** [http://www.toroenergy.com.au/\\_literature\\_87142/Letter\\_to\\_Shareholders\\_2011\\_-\\_Uranium\\_Market\\_Update](http://www.toroenergy.com.au/_literature_87142/Letter_to_Shareholders_2011_-_Uranium_Market_Update)
- 43** <http://icanps.go.jp/eng/120224SummaryEng.pdf>
- 45** <http://foe.org.au/anti-nuclear/issues/nfc/power/japan>
- 46** Dr Robert Floyd, Director General Australian Safeguards and Non-proliferation Office, Department of Foreign Affairs and Trade on October 31, 2011. Australia, Committees 2011, Joint Standing Committee on Treaties, page 9 accessed 03/03/12 at: <http://tiny.cc/goc1r>
- 47** <http://bos.sagepub.com/content/67/5/27.full>
- 48** <http://www.ans.org/misc/FukushimaSpecialSession-Caracappa.pdf>

## More information on the history of uranium exploration at Wiluna:

- 'High radiation levels 'more than hundred times' safe level at Wiluna mine', West Australian, 21/7/2010, <http://www.perthnow.com.au/business/high-radiation-levels-more-than-hundred-times-safe-level-at-wiluna-mine/story-e6frg2qc-1225895230599>
- 'Radiation high at abandoned uranium mine', Sunday Times WA, 20/08/2000
- 'Radiation fear at mine', West Australian, 24/8/2000
- 'Radiation reports prompt inspection', Kalgoorlie Miner, 22/8/2000
- 'Aborigines Irate Over Uranium Health Risk', Kalgoorlie Miner, 23/8/2000



