



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.

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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. Toro 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.



Gold mine on bed of Lake Way - Wiluna.

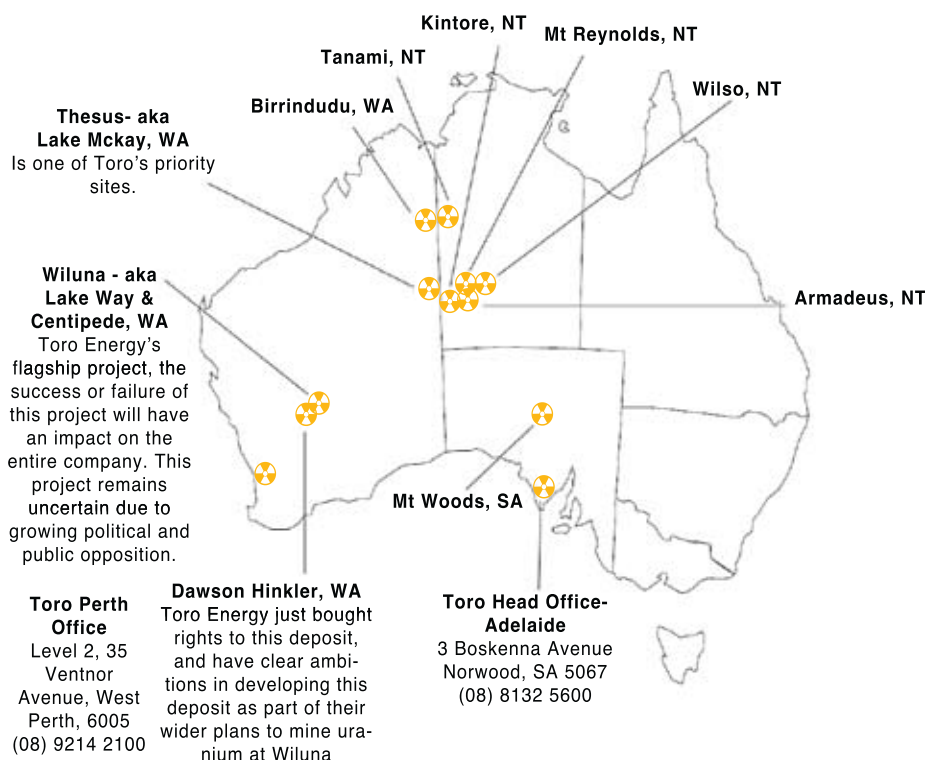


# TORO ENERGY LTD

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.

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. While some directors and senior staff have experience at the Ranger or Olympic Dam 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 Mirrar 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

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. The project is around 25 kilometres from the township of Wiluna in the East Murchison region about 600 kilometres north of Kalgoorlie.

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 is now being provided incrementally to the EPA but is not in the public domain. Requests to the EPA to disclose this information to the public have been denied.

Toro acknowledged that it had not fully verified the accuracy or completeness of its own application, and did not accept responsibility or liability for the information (and misinformation) provided in its application. Such a caveat is clearly unacceptable and undermines credibility in both the application and the assessment process.

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.



# 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.
- 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.
- 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.
- Toro acknowledges the need for a formal risk assessment in relation to security risks, however this has not been carried out.
- 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.
- 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 should be a minimum standard for any proposed uranium mine in WA, including Wiluna.



# 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 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.
- No calcrete uranium deposit has been mined in Australia and there is only one calcrete deposit presently being mined worldwide. 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.



***Oz Minerals, 43% shareholder in Toro Energy, was responsible for a spill of copper concentrate in flood waters north of Katherine in December 2011.***



# 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 Marruwayura 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.

# 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 and 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>2</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>3</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 indicative of certainty of its carcinogenic effects.*

In 2006 the US National Academy of Sciences released its Biological Effects of Ionising Radiation (VII) 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.

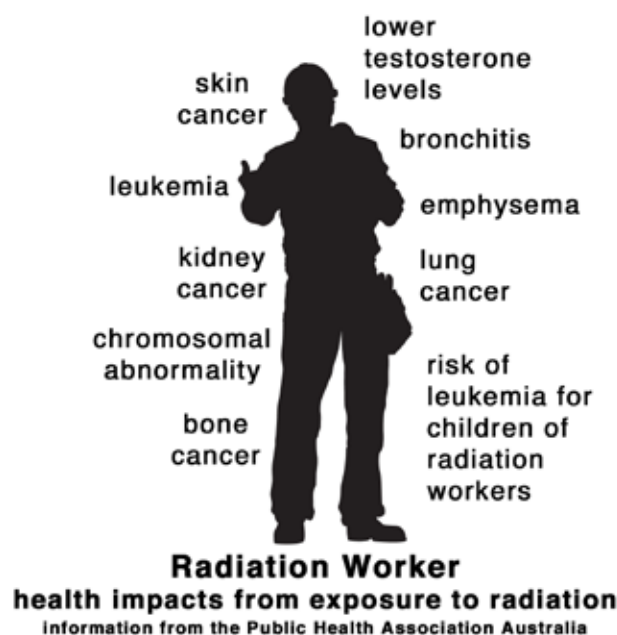
Toro's perspective is in clear conflict with the mainstream scientific view regarding low-level radiation, including:

- 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>4</sup> On the theory that low-level radiation is beneficial, 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>5</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 dose rates.”*<sup>6</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>7</sup> In fact reprocessing results in considerable releases of radioactive materials.<sup>8</sup> It is “*environmentally dirty*” according to the Deputy Director General of the World Nuclear Association.<sup>9</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 many countries are keen to dump their nuclear waste in Australia or anywhere else that will take it.<sup>10</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*”.



# URANIUM AND HEALTH

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.

Thus 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>11</sup>
- 25.2 tonnes of plutonium, sufficient for 2520 plutonium bombs similar to that which destroyed Nagasaki in 1945.<sup>12</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?



# 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>13</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>14</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>15</sup> TEPCO failed to prevent an easily preventable disaster.<sup>16</sup> The Fukushima disaster has further exposed long-standing patterns of corruption and collusion in Japan’s nuclear industry.<sup>17</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’.



# NUCLEAR POWER AND NUCLEAR WASTE

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>18</sup> Another preliminary estimate is *"~100s cases"* of fatal cancers.<sup>19</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



# 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>20</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>21</sup>

In March 2012 The Economist magazine branded the nuclear industry as *“The dream that failed”*<sup>22</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”*. As of the 6th of May 2012 there are no operating reactors in Japan.

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>23</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>24</sup> A 2011 UN report on the disaster found that it had caused *“hundreds of billions of dollars of property damage”*.<sup>25</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>26</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>27</sup> In the US you have an actively pro nuclear Government,<sup>28</sup> offering loan guarantees to five (now four) new reactors but none of these projects have secured finance for any of these 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 and 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>29</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>30</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>31</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>32</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>33</sup> (Note: 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>34</sup> – all with different but significant issues with transparency and democracy. Nuclear power will “*become less and less a creature of democracies*” as the Economist suggests.<sup>35</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>36</sup> That's one every 37 days. If you consider that there are 63 reactors world-wide under construction and that most of those have been in construction for 20 or more years and have experienced significant delays and cost overruns, it is not credible that this kind of reactor build could occur.

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>37</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.*



# THE BARRIERS TO AN EXPANSION OF NUCLEAR POWER

*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>38</sup>*

## SKILLED LABOUR SHORTAGE

Even if there were a new generation of reactors that were commercially available, if nuclear power was more acceptable to the public and politicians, if there were a comprehensive waste storage option for radioactive wastes, if it was safe and cost effective and there was no weapons proliferation risk there would still be a logistical barrier in a mass shortage of skilled labour to actually build new reactors.

A parliamentary committee in the UK considered the problem that they have an aging population of reactors and nuclear engineers. They consider that they have to massively increase their skilled workforce to decommission reactors and then increase again to build new reactors, while acknowledging that they will be losing a large proportion of the workforce to retirement.<sup>39</sup>

The industry widely accepts this as a major barrier to the sector's growth and have been actively trying to develop new training and university programs to address the gap.<sup>40</sup> There is no evidence that these initiatives have been successful.



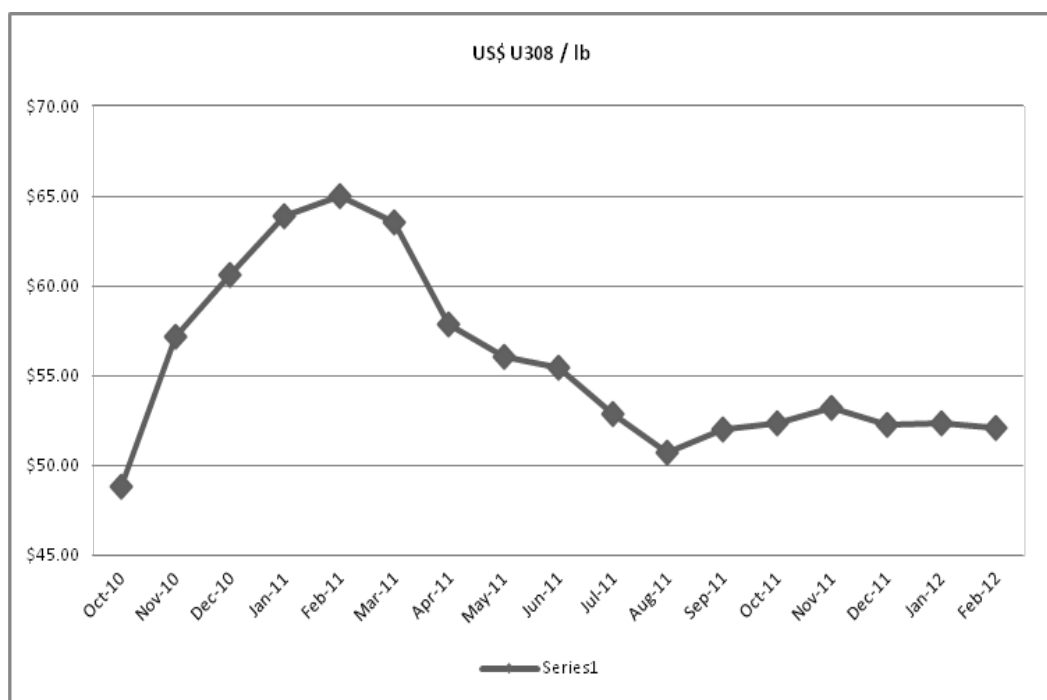
# THE BARRIERS TO AN EXPANSION OF NUCLEAR POWER

## URANIUM PRICE

The global uranium market remains uncertain and 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>41</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 is an example of the gap between the promise and the performance with recent media reports that: *"Paladin Energy's half-year loss has blown out sixfold after the uranium miner wrote \$US133 million off the value of an African mine.... Paladin management said the group had written off \$133 million after tax on the Kayelekera Mine - at Malawi in southeast Africa - blaming the 'deterioration of uranium prices' "*.<sup>42</sup>

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 loss.<sup>43</sup>



Data from:  
<http://www.indexmundi.com/commodities/?commodity=uranium&months=60>



# THE BARRIERS TO AN EXPANSION OF NUCLEAR POWER

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. 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. Big or small it is a bad time to be in the business of uranium.<sup>44</sup>

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.
- At least two uranium mining proposals in WA have been put on hold.

Despite all the hype uranium continues to contribute just 0.3 percent of Australia's export revenue and the industry accounts for just 0.02 percent of employment in Australia. The sector brings large risks and low rewards.

## INVESTMENT SECURITY CRITIQUE OF TORO'S ANALYSIS

Toro Energy recently gave presentations at the Paydirt industry conference in Adelaide with the disclaimer that: *"Any forward looking statements included in this documents involved subjective judgement and analysis and **are subject to uncertainties, risks and contingencies, many of which are outside the control of, and maybe unknown to Toro.** Actual future events may vary materially from the forward looking statements and the assumptions on which the forward looking statements are based. Recipients of the document are cautioned to not place undue reliance on such forward-looking statements. Toro makes no representation or warranty as to the accuracy, reliability or completeness of information in this documents and does not take responsibility for updating and information or correcting any error or omission which may become apparent after this document has been issued."*<sup>45</sup>



# THE BARRIERS TO AN EXPANSION OF NUCLEAR POWER

Toro hope to get all approvals needed to mine uranium by mid-year 2012. It is likely that this time line will not be realized given that by the end of March 2012 Toro was still submitting new information to the EPA for assessment on key components of the project that should have been completed mid 2011.

Toro has a number of further procedural hurdles and requires Federal Government approval before it can mine. In that time there will be a West Australian state election and while the current Liberal National Government supports uranium mining, WA Labor and the Greens do not. The lack of bipartisan political support for uranium mining is significant and the Wiluna project WA faces strong public and political opposition.

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>46</sup>

It should not be forgotten that Australian uranium – rock dug from South Australia and the Northern Territory - was inside the failed Fukushima reactor complex and is now spreading as fallout in Japan and beyond.

In October 2011 senior Australian government sources confirmed that: *“Australian obligated nuclear material was at the Fukushima Daiichi site and in each of the reactors”*.<sup>47</sup>

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.



**Clean up efforts continue following the 2011 Fukushima nuclear crisis**



# 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.



## APPENDIX: RADIATION RISKS TO URANIUM MINERS

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. 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.



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