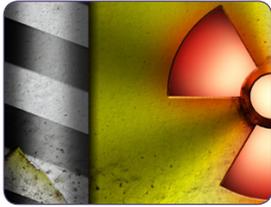


# Nuclear Power, Uranium Mining and Public Health



By Dr Peter Karamoskos MBBS, FRANZCR  
 A detailed, referenced version of this paper is posted at [www.mapw.org.au/nuclear-chain](http://www.mapw.org.au/nuclear-chain)

## Nuclear reactors and cancer

The radiation dose to people living near nuclear power plants is generally considered to be very small. However, studies assessing the incidence of childhood leukaemia around nuclear plants have shown disturbing findings. There is now reasonably strong evidence of a link between the proximity of nuclear power plants and childhood leukaemia. Further research is warranted.

## Accidents

The health risks of nuclear reactor accidents are potentially catastrophic. These risks can span multiple continents with possible contamination over vast distances and can lead to thousands of cancer deaths over the subsequent decades.

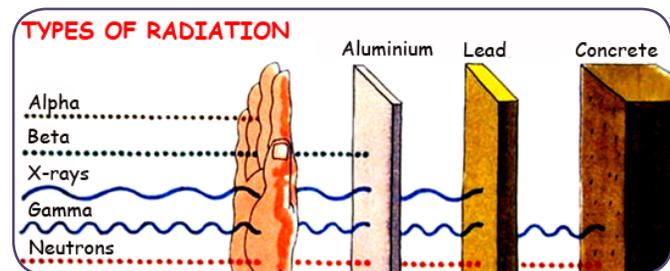
The risk of serious reactor accidents occurring is difficult to accurately gauge. Assessments rely on numerous estimates – often little more than guesses – about the likelihood of reactor components failing. Most risk assessments just assess the probability of an accident occurring – they do not assess the potential consequences of accidents.

A 2003 MIT study, *The Future of Nuclear Power*, assessed the probability of serious reactor accidents in a hypothetical scenario where the number of nuclear power reactors worldwide tripled by 2055. The MIT report found that "both the historical and the [risk assessment] data show an unacceptable accident frequency." (<http://web.mit.edu/nuclearpower>)

In addition to accidents, a well targeted terrorist attack could also lead to a major release of radiation.

## Ionising radiation

Radioactive materials such as uranium emit ionising radiation which can cause diseases including cancer. The established scientific view is the 'linear no-threshold' model which holds that there is no safe dose of ionising radiation and that the risk is proportional to the dose.



## Nuclear weapons

The dangers of proliferation of nuclear weapons associated with nuclear power are well established. Enrichment plants can produce both low-enriched uranium for reactors and highly-enriched uranium for weapons. Plutonium can be extracted from nuclear reactor fuel rods. It is difficult to determine the true intentions of a country with a nuclear power program.

The International Atomic Energy Agency admits that it is underfunded for its task of safeguarding nuclear power fuel and making sure it is not used in weapons. The IAEA can only hold physical inspections if the country in question grants permission. The IAEA may detect weapons production activities but it has no capacity or authority to prevent such activities. Australia has no capacity to safeguard our uranium exports – we are entirely reliant on the IAEA.



Dr Peter Karamoskos is a Nuclear Radiologist; Treasurer of the Medical Association for the Prevention of War; Treasurer of the International Campaign for the Abolition of Nuclear Weapons; and public representative of the Radiation Health Committee, Australian Radiation Protection and Nuclear Safety Agency (this does not represent an endorsement by ARPANSA of this document).



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## Nuclear Power, Uranium Mining & Public Health



### Radiation risks to uranium miners

There is a well established link between uranium mining and lung cancer. In 2009, the International Commission on Radiological Protection (ICRP) reported that radon gas (a radioactive gas present in underground uranium mines) delivers twice the dose of radiation to humans than they had previously thought. While the ICRP is in the process of reassessing the permissible levels, previous dose estimates to miners can be approximately doubled to reflect the real lung cancer hazard.

The Biological Effects of Ionising Radiation VI report (1999) reviewed eleven studies covering a total of 60,000 underground uranium miners. The report found an increasing frequency of lung cancer, directly proportional to the cumulative amount of radon the miners had been exposed to.

In addition to exposure to radon gas, uranium miners are also exposed to gamma radiation directly from the radioactive ore. At the Olympic Dam underground uranium and copper mine, the total annual dose per miner is approximately 6 millisieverts (mSv), of which 2–4 mSv are due to radon gas (allowing for the new ICRP risk estimate for radon) and the balance due to gamma radiation. Workers at the smelter at the Olympic Dam mine receive annual doses that may exceed 12mSv.

The Olympic Dam doses are typical of modern mine practices. The average miner at Olympic Dam is young and stays on average five years at the site. A calculation of the additional risk of cancer to uranium miners indicates that the average miner at Olympic Dam has a 1 in 670 chance of contracting cancer, most likely lung cancer, as a result of radiation exposure at work. Are

these risks properly communicated to miners so that they can make informed decisions about working in such environments?

Most modern uranium mines have air extraction systems to make sure radon levels remain low and miners are given personal protective equipment including masks to filter out the radioactive particulates. However, many underground miners find the masks extremely uncomfortable, especially where it is hot. It is estimated that around 50% of underground uranium miners in Australia do not use their masks, putting them at greater risk of lung cancer.



Official radiation warning of the International Atomic Energy Agency.

### Cancer in nuclear industry workers

Real-time monitoring of radiation exposure of nuclear industry workers has been occurring since the 1940s. More than one million workers have been employed in this industry since its beginning. However, studies have often investigated small groups of workers making it difficult to estimate precisely the risks associated with low levels of exposure. Risk estimates from these studies are variable, ranging from no risk, to risks similar to or greater than those seen in atomic bomb survivors.

In 2005 the results of a 15-country study of nuclear industry workers (excluding mining) was published – the largest study of nuclear industry workers ever conducted. The study found a statistically significant increased risk of cancer and leukaemia in nuclear industry workers, even at low dose.

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