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The medical and economic costs of nuclear power

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Jennifer Nordstrom, co-ordinator of the Carbon-Free Nuclear-Free project has noted "Telling states to build new nuclear plants to combat global warming is like telling a patient to smoke to lose weight."

A recent study sponsored by the German government (the KiKK study – Kaatsch P, Spix C, Schultze-Rath R, et al. *Leukemia in young children living in the vicinity of German nuclear power plants*. Int J Cancer. 2008; 1220:721-726,) examined children who lived near 16 of the country's commercial nuclear power plants. The results revealed a strongly increased risk of all childhood cancers, particularly leukaemia, the closer the proximity of the children's residence to the reactor. In particular, the study found that children less than the age five years, living within a 5km radius of the power plant exhaust stacks were more than twice as likely to develop leukaemia compared with those children residing more that 5km away. The KiKK team studied other carcinogenic factors which may be responsible for the cancer clusters but none were found.

Another large study (Baker PJ, Hoel DG. *Meta-analysis of standardized incidence and mortality rates of childhood leukemia in proximity to nuclear facilities*. Eur J Cancer Care. 2007:16:355-363) – a meta-analysis of the incidence and mortality rates of childhood leukaemia in children living near 138 nuclear facilities in Britain, Canada, Spain, Germany, the US and Japan also demonstrated a statistically significant rate of leukaemia in children less than nine years of age.

A further large review (Laurier D, Jacob S, Bernier MO, et al. *Epidemiological studies of leukemia in children and young adults around nuclear facilities: A critical review*. Rad Prot Dosim. 2008; 132:182- 190) of children and young adults living near 198 nuclear sites in 10 countries was found to be compatible with the study described above.

It is important to note that the sensitivity to the damaging effects of radiation in early embryonic and fetal life is much higher than in adults, and young children are also particularly vulnerable.

The radioactive elements "routinely" emitted from nuclear power plant stacks into the air can be inhaled, or ingested when they concentrate in the food chain – in vegetables and fruit, -and then further concentrated in various internal organs in humans. Similarly, the millions of gallons of cooling water flushed daily from a nuclear reactor into the always adjoining water source (lake, river or sea) contaminate it with radioactive materials which bio-concentrate hundreds of times in the aquatic food chain. The fish of course, who may ingest these materials in the surrounding water, routinely travel for tens and even hundreds of miles before they are caught by commercial or recreational purposes. And when caught their physical appearance does not provide any clues about such ingestion.

Unfortunately, radioactive elements are invisible to the human senses – taste, smell, and sight. Also unfortunately, the incubation time for radiation-induced cancer is five to 60 years, a long, silent latent period. No cancer ever denotes its specific cause.

Among these biologically active elements that are routinely released from nuclear power plants are tritium which lasts for more than 100 years (there is no limit to the amount of tritium that escapes); xenon, krypton. and argon which decay to cesium and strontium; carbon 14 which remains radioactive for thousands of years; cesium 137 – radioactive for hundreds of years; and iodine 129, which has a half life of 15.7 million years.

Tritium combines directly in the DNA molecule of the gene and can induce fetal deformities and various cancers in both animals and humans; cesium causes muscle sarcomas and brain cancers; and strontium – a calcium analogue – migrates to bone where it can induce bone cancer or leukaemia. Finally radioactive iodine causes thyroid cancer.

This situation is made worse by the fact that we are all – including populations living within the vicinity of nuclear reactors – routinely exposed to carcinogenic chemicals in our daily lives, many of which enhance the carcinogenic effects of radioactivity. There are now 80,000 chemicals in common use.

Turning from the human health costs to the monetary, another relevant study related to the nuclear power debate examined the economic feasibility of a “nuclear renaissance” at this time. The World Nuclear Industry Status Report published in August 2009 states that the nuclear industry continues to face steadily increasing construction costs and future cost estimates. The AREVA French-designed reactor project in Olkiluoto Finland is three years behind schedule and 55 per cent over budget (US$7 billion). There are now 435 commercial reactors operating globally, nine fewer than 2002. In 2008, nuclear electricity provided only 5.5 per cent of the international commercial primary energy production.

The average age of operating reactors globally is 25 years, while the average age of 123 reactors already closed is 22 years only. In addition to the 52 reactors currently under construction, another 43 reactors would have to be planned, built and started by 2015 – one every six weeks, and another 192 units over the following 10 years – one every 19 days – in order to maintain the same number that are operating today. With extremely long lead times of 10 to 15 years, this will be an impossible task, let alone actually increasing the number of reactors.

None of the new countries wanting nuclear power have the appropriate nuclear regulations, independent regulators, the domestic maintenance capacity and the skilled workforce to run a nuclear reactor. Nor do they have an adequate grid system to absorb the output of a nuclear power plant.

Furthermore some of these countries either have a government hostile to the concept of nuclear power (Norway, Malaysia, Thailand), hostile public opinion (Italy and Turkey), major economic problems (Poland), earthquake or volcanic risks (Indonesia) or some have an absolute lack of all necessary infrastructure (Venezuela).

France with its large nuclear infrastructure is currently threatened with a severe shortage of skilled workers. The Word Nuclear Industry Status Report reveals that currently only 300 nuclear science graduates are available in France for 1,200 to 1,500 open positions, and in the US only one quarter of such graduates plan to work in the nuclear industry. Most of the

current operators, baby boomers, are close to retirement.

And there is one other major bottleneck for new reactors – only one corporation in the world, Japan Steel Works, can manufacture large steel forgings for many reactor pressure vessels.

These problems, together with the global financial crisis mean that the prospects of funding for the nuclear industry – most of which is government sourced – looks grim. New reactors are too risky and expensive to attract private investor funding, and the nuclear industry will not proceed with its "new build" unless they can transfer the risk to the tax payers or ratepayers.

In the US, efforts to forge the nuclear industry renaissance has been thwarted in eight states from Kentucky to Minnesota to Hawaii, Illinois, West Virginia, California, Missouri and Wisconsin. When the Yucca Mountain repository for high level waste was vetoed by President Obama, Dave Kraft, Director of the Nuclear Energy Information Service in Chicago said "Authorising construction of nuclear reactors without first constructing a radioactive waste disposal is like authorising the construction of a new Sears tower without the bathrooms. Neither makes sense; both threaten public health and safety."

How does this state of affairs relate to Australia? Well, as we know Australia sits on 40 per cent of the world's high grade uranium; the ALP, in its wisdom, has determined that there should be no restrictions on uranium mining proceeding throughout the country. There are more than 60 potential uranium mines in Western Australia alone. In South Australia, the Olympic Dam mine owned by BHP Billiton is to triple in size to become the largest uranium mine in the world. Honeymoon, Beverley and the Four Mile deposit are all located in South Australia, the latter two are owned by an American company General Atomics, a weapons corporation which also manufactures the pilotless drones that are currently used by the military in Afghanistan and Pakistan.

In the light of these two studies it is difficult to understand how Kevin Rudd and the Labor Government can have no moral scruples about our uranium exports.

Dr Helen Caldicott, has devoted the last 38 years to an international campaign to educate the public about the medical hazards of the nuclear age and the necessary changes in human behavior to stop environmental destruction. She is also the Founding President of the Physicians for Social Responsibility which, with other national groups won the Nobel Peace Prize in 1985. She is President of people for a Nuclear Free Australia and a member of the Spanish Scientific Committee advising the Spanish Prime Minister.

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