

Mr Steve Mercer
Director
Referrals Section (EPBC Act)
Approvals & Legislation Division
Environment Australia
GPO Box 787
CANBERRA ACT 2601

Fax: 02 6274 1789

Email: epbc.referrals@ea.gov.au

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Dear Mr Mercer

We write in response to the invitation for public comments on whether Steritech's proposal to construct and operate a gamma sterilisation and decontamination plant using radioactive Cobalt 60 as the source of gamma radiation is a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999*.

We believe that the action *is* a controlled action. We believe the following matters of national environmental significance are triggered by this proposal. These are:

- Ecological character of a declared Ramsar wetland
- Internationally protected Migratory species
- Nuclear Actions

The following describes our concerns for the environment and people of Australia should this proposal be allowed to proceed.

1. In objecting to the proposal to build an irradiation plant at Narangba, Caboolture Shire, this submission takes a holistic view of the nuclear industry and its historical record.

We examine some of the numerous problems with irradiation sterilisation plants and the irradiation of food. Documented accidents from irradiation facilities around the world report equipment failures, operational errors, fires, spills, radiation exposures, deaths, ground and water contamination, mismanagement and cover-ups. Facilities such as that planned for Narangba are allowed to leak low level radiation into the surrounding environment. Low level ionising radiation causes cancers, birth defects and genetic disorders. Furthermore, irradiation workers have suffered horrible burns, amputation, sterility and death from acute exposure to high level radiation.

Other points are included to provide a greater understanding of the dangers of radioactive substances, and radiological protection measures. We especially bring your attention to point 9 regarding inaccuracies in Steritech's presentation of data regarding the levels of radioactivity in the plant. We also examine the transport of the highly radioactive Co-60 sources and wastes from Canada or the UK and back. We discuss the incompatibility of noxious and nuclear industrialisation with the principles of ecologically sustainable development. We argue that Caboolture Shire should remain a Nuclear Free Zone.

2. The need for an Environmental Impact Assessment

Steritech's proposed facility at Narangba is clearly a Nuclear Action, therefore requires a full environmental assessment under the Act. During the Steritech have clearly stated in their Referral Form that the proposed plant is a Nuclear Action.

The nuclear facility has the potential to impact upon;

- Moreton Bay marine environment,
- surrounding Ramsar wetlands,
- national impact from involvement in the broader nuclear industry,
- social stability from residents who are upset about the construction of a nuclear facility and have expressed their opposition. The Council reassured the Narangba residents that the plant was not nuclear and that Steritech would use 'safe radiation'. This information is deceptive.

Environmental considerations such as fauna habitats are not relevant when assessing the environmental impacts from the facilities construction as the site has previously been cleared of vegetation. More relevant issues need addressing such as the potential for contamination of ground water, the potential for residents to be exposed to gamma radiation and the environmental consequences of an accident during transport of the radioactive Cobalt-60 material. We are concerned that the environmental impacts of the proposed nuclear facility have not been assessed.

We believe that the information provided to EA in Steritech's Referral Form is inadequate to allow EA to effectively assess the environmental impacts from the facility. An official Environmental Impact Assessment is an obvious prerequisite for EA to seriously assess the environmental impacts from the nuclear facility not only to the immediate area but to the Saltwater Creek catchment and Moreton Bay. For example, the actual construction site is not directly on a Ramsar site, however what impacts could the facility have upon surrounding Ramsar sites in the Saltwater Creek catchment? What are the impacts upon birds and other native fauna from an industrial area that allows a toxic industry?

3. Ecologically Sustainable Development

Most surprisingly, it seems that the proposal does not constitute an "environmentally relevant activity", and therefore is not subject to State Environmental Protection Agency legislation. Instead, it comes under local government control under the new Integrated Planning Act. Local governments are expected to pursue the principles of ecologically sustainable development (esd) that the Australian government is committed to as a signatory to the "Agenda 21" international agreement (UNCED, 1992).

The development application contravenes the principles of esd because it:

- disregards the precautionary principle which states that an action should be avoided if it has the potential to cause harm
- disregards intergenerational equity by creating radioactive waste which remains dangerous for up to millions of years
- undermines ecological integrity, and
- fails to place an appropriate value on environmental resources and amenity.

4. George West's public credibility

Steritech's application submitted to the Caboolture Shire Council on 14th May 1999 for the nuclear facility at Narangba stated their intention was to irradiate medical, pharmaceutical, cosmetic and 'other' products. In January 2000 Steritech publically rejected rumors for the company's plans to irradiate food at their nuclear facilities. Mr West was quoted in the Northern Times newspaper; "We certainly wouldn't be putting any money down on that line (food irradiation). We're not that stupid". However, on the 3rd May 2000, Steritech applied to the Australia New Zealand Food Authority (ANZFA) to amend the Australian Food Standards Code for the irradiation of herbs, spices, nuts, oilseeds and teas. We are concerned that Steritech were not clear in their intention to irradiate food in their application to the Council, since in their application to ANZFA it became clear that 'other products' *are* indeed food products.

Their information brochure on the proposal (Steritech, 1999) states that the plant will attract "associated industries to the Caboolture Area", and that "increased export sales will be generated as a result of being able to irradiate fruit and other produce for the export market". Hence they are clearly stating their intentions for food irradiation processing.

The nuclear industry claims irradiation is necessary to kill bacteria, and makes food "safe". This implication that non-irradiated food is "unsafe" is simply not true as long as the food is handled appropriately. To the contrary, there are many problems with the safety of radiation processed foods. These include deterioration in the quality of the foodstuff, and uneven exposure leaving dangerous pockets of micro-organisms remaining in the food.

A recent survey conducted by ENUFF (Everyone for a Nuclear Free Future) revealed that food industries involved in Steritech's Application A413 for food irradiation do not actually want the technology or see a need to irradiate their products. They are concerned that it will have negative impact on sales due to customer rejection. The survey also revealed that some tea companies are even putting in their own submissions opposing food irradiation.

We are concerned that Steritech's involvement in food irradiation in Australia has been deceptive which undermines their credibility.

5. Safety

Following nuclear disasters, accidents and leaks in the northern hemisphere, the nuclear industry is in decline in other western nations. As a consequence, the industry is gearing up for a massive expansion in Australasia. Irradiation plants such as that proposed for Narangba are another means for the nuclear industry to expand its business. Caboolture Shire should be proud of its "Nuclear Free" status and keep it this way.

Although we accept that the Qld State Health Dept demands strict standards and conditions surrounding the operations of such a plant, and we do not doubt the expertise and good intentions of individuals working on radiological protection, we do however take a broader view of the nuclear industry as a whole (see section 4 on radiological protection). In its fifty-odd years of operations the nuclear industry has left an unacceptable legacy of accidents, disasters, cover-ups, secrecy and corruption in all stages of its operations, from uranium mining to disposal of radioactive waste¹.

Commercial facilities such as that planned for Narangba are allowed to leak low level radiation into the surrounding environment. Low level ionising radiation causes cancers, birth defects and genetic disorders. Irradiation facilities around the world have had accidents due to human error, equipment malfunction, and deliberate disregard for safety. The minutes of an National Radiological Council (NRC) Irradiator workshop held in Arlington, Texas on 24th May 1988 include over 50 pages of documented accidents, equipment failures, operational errors, fires, spills, radiation exposures, deaths, ground and water contamination, mis-management and cover-ups.

¹ These are too numerous to mention here. Please contact FoE for more details.

In January 1999, Pacific Northwest National Laboratory (supported by the US Dept. of Energy) gave a presentation to the Health Physics Society in Albuquerque, New Mexico. They stated that acute radiation deaths or injuries of food irradiation workers was a major impediment to the acceptance of food irradiation processing. The presentation described irradiator accidents as “ghastly: horrible burns, amputation, sterility, death” (Strom and Watson, 1999).

The unquestionable and unavoidable links between the nuclear industry and the production and use of nuclear weapons provide us with grave concerns. Since the first atomic bombs were dropped in Hiroshima and Nagasaki in 1945, around 2,060 further atmospheric bombs have been exploded around the world in peacetime “tests”. Whole populations have been exposed to the fallout from these explosions, some deliberately. The recent wars in Iraq and Kosovo were nuclear wars through the use of depleted uranium ammunition. Vast tracts of land have been contaminated with radiation, causing consequent health impacts such as genetic abnormalities in new-born babies. Depleted uranium is byproduct of the nuclear cycle² therefore some responsibility for such atrocities must fall on the shoulders of the nuclear industry.

We are concerned that there is no safety plan to provide emergency procedures to residents in the event of an accident involving radioactive substances. An accident of this nature is foreseeable, therefore it should be considered when planning emergency requirements. Steritech have admitted that ‘...there would be reasonable time for the evacuation of local people to take place before excessive doses are received’.

Steritech claim that the transport of the radiation sources to and from the plant will be carried out will have negligible environmental impacts. However, they fail to address the environmental impacts in the event of a transport accident.

6. Accidents at irradiation plants

Steritech claim in their Referral Form that through their years of operation their plants remain accident free. We would like to highlight to EA the following accidents that have occurred at Steritech facilities:

Facility in Dandenong, Victoria.

- In May 1979, a basket gate jammed in the overhead rollers, buckling the gate and jamming the source rack. It took 30 minutes to free the Cobalt-60 source so it could descend into the pool. A further 8 hours were needed to ‘redesign’ the basket gate.
- In 1986, an Australian Federal Member of Parliament inspected the plant’s records. His investigation revealed that the plant had been shut down for 5 days in August 1980 because the wire cable controlling the Cobalt-60 source rods had jammed while the source was exposed, preventing the rods from being lowered into the containment tank, and they remained exposed for five and a half hours. Later the cable was described as being cut, but the Managing Director Mr. George West claimed that it had snapped when he appeared before the Australian Parliamentary Standing Committee in 1987.

Other known accidents have also occurred in New Jersey, Hawaii, Italy, Norway, San Salvador and Connecticut. Following are three examples:

- Hawaii’s ‘causal occurrence’ in 1967 cost US\$385,000 in 1979 to clean up after contamination of the pond water, shipping cask, machinery room, tools and workers clothing. By 1980, residual contamination at dangerously high levels was still detectable on the lawn outside the building.
- In 1981, in another Canadian designed irradiator, aluminum boxes jammed into the radioactive source. The control panel indicated that the Cobalt-60 rods were safely lowered into the containment tank, but monitors indicating high levels of radiation warned workers that all was not well. When the experts flown in from Canada eventually managed to lower the source, several Cobalt-60 rods were dislodged and had to be recovered with long handled tools and mirrors.

² Uranium enrichment process.

- At the Institute for Energy Technology Irradiation Plant, Kjeller, Norway there was an accident that resulted in the fatality of a worker. Failed safety devices allowed the maintenance worker to enter the irradiation cell when the source was exposed. He died 13 days later.

We have outlined the above accidents to highlight that accidents can and do happen in irradiation plants.

7. Alternatives to Food Irradiation

Food irradiation extends a product's shelf life for the convenience of exporters and with disregard for consumer's health. The amount of "food miles" clocked up each year in food transport is considered to be a major factor in social and environmental problems. The healthiest, most nutritious food is fresh, organically, and locally grown.

Rather than engage in a global trade of highly dangerous radioactive materials and waste, we suggest there are other options for sterilisation such as steam, hot forced air, and electron beam sterilisation.

7.1 Safer irradiation technology exists.

The main problem with a Co-60 source rack is that it is highly radioactive 24 hours a day, every day of the year. Other suggested radiation options (as mentioned by Steritech's solicitor) are electron beam and X-rays. These sources of radiation are supplied via high voltage electron accelerators that are powered by electricity, and the radiation beams are turned off when the power is turned off.

Electron beam has a shorter penetrating distance than X and gamma rays, but is sufficient if bulk packaging is removed from most goods. Steritech's Lawyer mentioned the alternative sterilisation techniques of: heat, gas, electron beam and X-rays. He talked about the benefits of gamma radiation over heat and gas, but did not compare gamma to electron beam and X-radiations.

7.2 The benefits of electron beam and X-rays over Co-60 are:

1. they avoid the transportation dangers inherent in the continual exchange of radioactive Co-60 from Canada (every 12 to 15 months)
2. They can be turned on and off, therefore the plant can be shut down over night or during holiday or maintenance periods. This not only reduces the dangers to workers, but also vastly reduces the leakage of radiation outside the building.
3. The ability to produce radiation depends on the supply of electricity. Should an accident occur that disconnects the power supply (eg earth tremor), the machine is automatically and immediately rendered safe, unlike a Co-60 system which can experience electric and physical failures as demonstrated by the 3 accidents at Australian irradiation facilities outlined in the document titled *Some of the Known Accidents at Nuclear Irradiation Plants Around the World*. In the event of a natural or human-caused disaster, It would take hours or even days to mitigate the damage from Co-60. Procedures would involve covering the Co-60 with sand, or concrete, and even then would not be a final solution to the problem of radioactive containment.
4. The electron or X-ray beam is focussed in a particular direction, compared to the Co-60 which emits randomly in all directions from the source. Therefore the electron or X-ray beam can be more effectively shielded, further reducing the leakage of radiation from the chamber.

8. The use of Co-60 as an irradiation source for sterilisation should be rejected on the grounds of insufficient margin of benefits in relation to the dangers perceived.

Considering the alternatives discussed above, the use of Co-60 contravenes the Policy Objectives of Queensland Radiation Health Regulatory Impact Statement: *Radiation Safety Regulation 1999 and Radiation Safety Standards* which are “to minimise the health risks to any person”.

Co-60 produces unnecessarily high radiation levels outside the irradiation chamber which contravenes the principles of public health. Contrary to Steritech’s solicitor’s statement that the gamma radiation from Co-60 does not penetrate the concrete shielding walls, it does, and leads to elevated levels of radiation outside the plant. One estimate from John O’Neill of Alphatech Systems Ltd, Auckland, is that the radiation levels from the plant could be as high as 4 times the natural background level at the perimeter fence.

Although Steritech have undertaken to limit the dose, and this would be monitored by QRH, a true *minimisation* of the dose would preclude the use of Co-60. This minimisation is necessary following recent research such as that by Drs Alice Stewart, John Gofman *et al.* that point to evidence that prolonged exposure to low levels of radiation can be as harmful to health as an acute high level dose.

We are disturbed that the ALARA (As Low As Reasonably Achievable) principle is widely quoted in radiation protection, but rarely used.

To give a relative indication of the amount of radioactivity proposed in the Narangba plant (300,000 Ci up to capacity of 3,500,000 Ci), compare this with the accumulated radioactivity of radioactive sources used in radiotherapy medicine in the average hospital in Brisbane of around 1Ci.

9 Steritech’s inaccuracy in quoting radioactivity levels

We have grave concerns with the discussions about radioactivity levels in Steritech’s referral letter. Quite simply, they make no sense scientifically. The units quoted are wrong - eg. In Point 3.3, 1.2×10^6 Becquerel is quoted as the initial loading. Whereas, in fact the initial loading of 300,000 curies should read as 11,100 TBq or 1.11×10^{16} Bq. This figure greatly exceeds the limit for Co-60 defined in regulation 2.02 and quoted by Steritech of 1014 Bq. We hope the EPBC referrals division will investigate this issue thoroughly.

10. MODERN?

George West refers to Co-60 technology as “modern”. We dispute this statement and assert that it is outmoded and dangerous. The medical field of radiotherapy *used* to use Co-60 quite extensively for treatment of tumours. Since the 1980’s, for the reasons presented above, Co-60 treatment machines are being replaced by the safer X-ray technologies in the form of Linear Accelerators, although tiny Co-60 sources of the order of mCi are still used (compare this to the 300,000 curies of radiation in Steritech’s proposed plant).

Although I have argued here for the use of safer radiation methods for sterilisation, correspondence with food scientists and nutritionists have alerted me to the danger of free radicals that are produced when ionising radiations such as electron, X-ray and gamma rays interact with matter. Free radicals interfere with anti-oxidants in our bodies to suppress our immune system functions, and can cause cancers. This is a major concern with Food Irradiation.

11. Radiation and Health

11.1 Radiological Health Impacts

Cobalt-60 is highly radioactive and dangerous to all forms of life. This section explores the dangerous health impacts suffered from exposure to nuclear radiation. Life in the biosphere is exposed to variable levels of background radiation from natural sources. The nuclear industry increases this radioactive load on the biosphere through the mining of uranium and consequent processing and use of radioactive substances in the nuclear cycle and associated nuclear industries.

Nuclear or “ionising” radiation is invisible, consisting of high speed particles or electro-magnetic waves. Ionising radiation damages living tissue by breaking chemical bonds and causing biochemical change, severely disrupting the chemistry of cells (MAPW, 1997).

Although the self-healing capacities of living tissue are great, it is not possible for the body to perfectly repair all radiation damage. Ionising radiation can kill or permanently damage cells which are then no longer able to conduct their normal biophysical processes, leading to adverse health effects in the living organism. The nuclear cycle also produces types of radionuclides (such as Co-60) not found in nature. These artificial radionuclides behave differently in the human body to naturally occurring background radioisotopes, leading to novel health impacts (Dr Bertrell, 1985).

Radiation can impact on living tissue either from an external radiation source, or from an internally ingested or inhaled radioactive particle such as those released from nuclear plants. If ingested into the blood stream, radioactive isotopes mimic the biological behaviour of nutrient elements on the bodies metabolism. Thus, specific radioactive isotopes follow specific nutrient pathways and locate in specific body organs where they continue to irradiate the tissue for as long as they remain radioactive. Co-60 affects the liver and reproductive systems in particular.

Children living around the Chernobyl nuclear reactor are now suffering radiation induced ill-health following the accidental explosion in 1986. Health problems affecting children in the region include thyroid, stomach and liver problems and serious genetic deformities. In one village of 200 children, only four are considered healthy.

Exposure to ionising radiation accelerates the aging process, decreases general health levels, increases breakdown of vital bodily processes, and leads to complications which usually don't appear until decades after exposure has occurred. Specific health effects resulting from radiation poisoning include skin cancers, decreased testosterone, bronchitis, emphysema, lung cancer, kidney cancer, leukemia, chromosomal abnormalities, and leukemia in the children of those exposed.

11.2 Radiological Protection

The following discussion of the development of radiological protection provides a greater understanding of the meaning of dose limits and standards as set by radiological protection bodies. All our medical knowledge of the human health effects of radiation exposure comes from nuclear accidents, bombings or experiments performed on unwilling or unwitting populations such as those of Hiroshima and Nagasaki, and the Pacific Islands in “peacetime”.

Since radiological standards first started being set in the 1950s, the International Commission for Radiological Protection (ICRP) have been continually revising the “safe permitted levels” of exposure to radiation downwards as more information about the devastating health impacts became available or undeniable over time. The ICRP now admits there is no safe lower limit of radiation exposure. Low levels of exposure sustained over a period of time are as dangerous to health as acute high dose exposures (New Scientist article, 1997).

Despite this, the ICRP continues to publish “permissible”, yet arbitrary, levels for categories such as “workers in the nuclear industry”, “members of the public” and “pregnant women”. The resulting human casualty rate is justified by an economic trade off between public health on the one hand and access to jobs and products of the nuclear industry on the other. Radiological protection standards do not protect life from ionising radiation, thus we are not reassured by the proponent's view that “the facility's operations are completely environmentally safe” (Steritech, 1999).

11.3 Transport of Radioactive Substances

The nuclear industry transforms radioactive materials into other types of radioactive substances via the nuclear cycle of uranium mining, milling, nuclear fuel enrichment, reactor operation, fuel reprocessing, nuclear weapon manufacture, reactor and weapons decommissioning, and other associated nuclear industries such as irradiation. The Cobalt-60 that Steritech plan to use in their irradiation plant is formed in nuclear reactors from Co-59 and is highly radioactive. Each stage of the nuclear cycle creates radioactive wastes.

Steritech propose to ship the high-level radioactive Cobalt-60 rods for use in the new irradiation plant from UK or Canada, passing through the port of Brisbane and along public roads. These are highly radioactive and highly dangerous. Steritech would also have a contract to return the highly radioactive wastes back to the country of origin for disposal. Shipping radioactive materials and wastes around the world only increases the risk of accidents and radioactive substances being lost at sea.

12. Management of Wastes

Steritech are being blatantly misleading when they state: “Consequently, there is no waste product from the plant” (Steritech, 1999). There *is* waste, in the form of “spent” Co-60 rods. Although their radioactivity will be reduced to and it will be shipped back around the world. However, there is no proven solution for the safe management of these wastes for the timescales necessary. They remain dangerous to life for up to millions of years. Steritech should provide details of how their wastes are to be managed.

13 Jobs

The \$5m project will create around 80 jobs in the short term. Most of these short term jobs will be in the construction of the 2 m thick concrete walls to shield the radioactive sources. In the longer term it is expected that the plant will employ only around 20 people. Most of these will be positions requiring a certain amount of expertise with radiation physics, and it is unlikely that many locals will be employed by the facility.

14 Noxious Industries

The proponent’s application to Council requires the rezoning of the land to noxious industries, and they expect to “attract associated industries to the Caboolture area” (Steritech, 1999). Such a rezoning seriously threatens the environmental quality of the Sunshine coast and hinterland north of Brisbane which is currently renowned for its natural beauty.

15 Conclusion

In conclusion, we have found the Steritech proposal totally disregards the serious radiation hazards posed by the irradiation plant. Co-60 is highly radioactive and dangerous to all forms of life. The population and environment around the plant, along the Co-60 transport route, and around the waste disposal site will be threatened by high and low level radiation exposure. The risks are too high to justify the development of a new nuclear industry. The immense radiological protection protocols necessary to try to keep the facility safe are simply not worth the effort when accidents do happen and safer alternatives exist.

Sustainability is the industry of the future, not nuclear. Nuclear industries threaten interconnected ecosystems and reduce ecological biodiversity. Please consider the future health and well-being of the Shire’s children, and their children’s children. We ask that you protect what remains of our fragile environment and choose to reject this development application before it creates a radioactive wasteland of our precious environment.

Thank you for considering this submission. If you would like any additional detail on any of these matters, please do not hesitate to contact us,

Yours sincerely,

Anna Barnes (Everyone for a Nuclear Free Future)

Sybil MacLure (Friends of the Earth)

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