Australian Nuclear Forum Inc.

P.O. Box 2034, Woolooware, NSW 2230
(www.netspace.net.au/~oznucforum)

28/4/06

The Hon Julie Bishop MP
Minister for Education, Science and Training
PO Box 6022
House of Representatives
Parliament House
Canberra, ACT 2600

Dear Minister

RE: The teaching of nuclear science in years 9-10

Nuclear science is an integral part of modern physics, chemistry and biology. The ANF has recently published a policy paper which outlines the Forum's views on the current state of nuclear science education in this country (enclosed). The paper also puts forward some recommendations as to what our members believe should be done to bring this branch of education to a standard that would best serve the community.

Important in these recommendations is that pertaining to the years 9 and 10 science curriculum – the science teaching that applies to all students. The ANF maintains that the curriculum should emphasise the three subject areas: (a) radiation (especially natural background radiation), (b) nuclear medicine, and (c) nuclear power. Toward this end we have developed a list of key points in these areas that we believe should be emphasised (also enclosed).

We offer these suggestions to improve science education in this country, not to promote a political viewpoint, but because it is our view that the study of science is fundamentally not political even if some of its applications may be so construed.

Yours sincerely

Jim Brough, President

Copies to the federal and state ministers of education and the national and state science teachers associations

(Note: Nuclear Education policy paper is given elsewhere on homepage)

SUGGESTED INCLUSIONS IN YEARS 9-10 GENERAL SCIENCE: Outline and Key Points

AUSTRALIAN NUCLEAR FORUM
28/4/06

1. RADIATION

(a) The common nuclear radiations alpha, beta and gamma come from decaying radioactive atoms (i.e., radionuclides).
(b) Radioactive atoms exist everywhere on earth and are mostly natural (e.g., uranium averages 2ppm in the earth's crust).
(c) Nuclear radiation is ionising radiation as is X-radiation.
(d) Ionising radiation can change the molecules in matter and damage human tissues.
(e) The extent of tissue damage is determined by the amount of energy deposited in the tissue by the radiation – averaged over the body this is expressed in millisieverts (mSv).
(f) Humans are continually exposed to natural background radiation both from external (ground, air and cosmic) and internal (potassium and radon) sources.
(g) Natural background radiation varies with location from 1mSv/y (Australian ave. 2mSv/y) to over 100mSv/y without affecting human health.
(h) Past atmospheric nuclear bomb testing added about 0.01mSv/y to background radiation.
(i) Ionising radiation is widely used in industry, agriculture, scientific research and medicine.
(j) Common radiation detectors are Geiger counters, scintillation counters, thermoluminescent detectors and photographic film.

2. NUCLEAR MEDICINE

(a) Nuclear medicine uses radioisotopes mainly for diagnosis and judging the severity of many diseases.
(b) Some conditions are treated with radioisotopes.
(c) Each year in Australia over 400,000 patient doses are used in medical procedures using radioisotopes made in reactors or cyclotrons.
(d) Diagnostic nuclear medicine tests expose patients to minor amounts of radiation.
(e) Most nuclear medicine tests involve imaging with scintillation counters.
(f) Some nuclear medicine studies allow a substance like radioactively labelled glucose to be followed in the brain (or other organs) to see which parts are working during a particular activity like seeing or listening to music. They may also show the effect of medication on brain receptors in diseases such as schizophrenia.

(g) Other nuclear medicine tests are quantitative and allow measurements of, for example, how well the heart pumps or the kidneys work.
(h) When given as a treatment, larger doses of radioisotopes are used to reduce the function of overactive tissues such as that of the thyroid or tumours.
(i) Directed irradiation of the body from external sources can also be used to retard or kill some cancers.

3. NUCLEAR POWER

(a) Australia makes most of its electricity by burning coal and natural gas.
(b) Nuclear power is another way of producing heat to make electricity.
(c) 16% of the world’s electricity comes from nuclear power (i.e., 11 times the electrical output of Australia) and France generates over 80% of its electricity with nuclear.
(d) Nuclear power stations are usually fuelled with uranium but also produce and burn plutonium.
(e) Plutonium from modern commercial power reactors is not used to make nuclear explosives.
(f) Breeder reactors “burn” plutonium but make more than they burn and thus increase the utilisation of uranium by about a factor of 60.
(g) Thorium can also be irradiated in reactor to produce uranium for reactor fuel.
(h) Australia has about 30% of the world’s economically recoverable uranium and about 25% of the thorium.
(i) Most nuclear wastes can be recycled and destroyed in reactors leaving a small amount to decay for about 400 years.
(j) The Chernobyl reactor was an unsafe design used only in the old USSR and was improperly operated prior the accident.
(k) Chernobyl reactor accident health effects were less than 5000 children with treatable thyroid cancer, and possibly 4000 additional cancer deaths in the highest exposed group (626,000 people) – other possible deaths are the subject of much speculation amongst the experts.