CANCEL NUCLEAR POWER PROPOSAL

MEMORANDUM

to the

Prime Minister of Malaysia
Menteri Besars and Chief Ministers
Ministry of Energy, Green Technology and Water
Ministry of Science, Technology and Innovations
Ministry of Natural Resources and Environment
Cabinet Ministers
Economic Planning Unit
Agensi Nuklear Malaysia
Tenaga Nasional Berhad

submitted by

Consumers' Association of Penang
& Sahabat Alam Malaysia

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1.0 INTRODUCTION

Nuclear power has been generating energy for the world for more than half a century, but it is not without problems. Nuclear power is an expensive, uneconomic, unsafe, polluting and dangerous technology. It creates nuclear waste of which there is yet a safe way to store and runs the risk of catastrophic accidents.

Does Malaysia really need the energy from nuclear as we are actually enjoying a surplus? Current electricity consumption is 14,000 megawatt (MW) but we have an installed capacity of 23,000 MW. That gives Malaysia an extremely comfortable margin as the government's target is only 20%. We also believe that energy efficiency and renewable energy can meet our energy needs and our emissions targets in a clean, safe way without nuclear power.

Following are the reasons why Malaysia should not opt for nuclear power.

2.0 NEGATIVE IMPACTS

2.1 Health Impacts

Nuclear reactors have serious environmental and public health impacts. Radioactive air and water pollution is released through the routine operation of all nuclear reactors. A wide range of radioactive isotopes are released with varying radioactive and chemical properties – some toxic, some not, some more radioactive than others, some lasting minutes, some lasting billions of years[1].

Exposure to radiation increases the risk of damage to tissues, cells, DNA and other vital molecules, potentially causing programmed cell death (apoptosis), genetic mutations, cancers, leukemia, birth defects, and reproductive, immune, cardiovascular and endocrine system disorders. Children and the unborn are especially susceptible because of their rapid cell division during physical growth. DNA is most vulnerable to radiation impact while cells divide.

The United States National Academy of Science reported in its Biological Effects of Radiation Report V11, 2005, that there is no threshold beneath which exposure to radiation is not dangerous.

A study in Mainz, German shows the risk of getting cancer, particularly leukemia, is increasing for children growing up in the neighborhood of a nuclear power station. This research was commissioned by the German *Bundesamt für Strahlenschutz* (BfS, Federal Office for Radiation Protection).

The result showed a significantly higher risk to get cancer if the children lived within a circle of less than 5 km around a nuclear power plant. There were 77 cases of cancer (60% more than expected in normal statistical values) and 37 cases of leukemia (117% more than expected)[2].

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[1] Routine Radioactive Releases from Nuclear Reactors. http://www.nirs.org/factsheets/routineradioactivereleases.htm

[2] http://www.bfs.de/en/bfs/druck/Ufoplan/4334_KIKK.html

The study also found a statistically significant regression coefficient between the increased incidence of leukemia and distance from the nuclear power stations. This conclusion was confirmed in a detailed analysis[3].

There are a number of other studies which reveals the increased risks for getting cancer even at very small dose of radiation. The result of the German study proves that the risk for children to get cancer increases the closer they live to a nuclear plant.

Living near a nuclear facility also increases chances of dying from breast cancer. A USA nationwide survey of 268 counties within 50 miles of 51 nuclear reactors, found breast cancer deaths in these "nuclear counties" to be 10 times the national rate from 1950 to 1989[4].

A study revealed that in the seven years after the closure of eight nuclear reactors in USA, infant mortality rates (deaths to infants below 1 year of age) fell dramatically in downwind communities[5].

Another concern is an increase in the rate of thyroid cancer incidences. The only major known cause of the disease is exposure to radioactive iodine, which is emitted into the air by nuclear plants. An article in the International Journal of Health Services showed that the highest rates of thyroid cancer in the U.S. occurred in a 90-mile radius of eastern Pennsylvania, central New Jersey, and southern New York. In this area, there are 16 nuclear reactors at 7 plants, the highest concentration in the U.S.

Radioactive iodine is one of many chemicals produced only in nuclear reactors and weapons. It is routinely and accidentally released into local air by reactors and enters human bodies through breathing and the food chain. Radioactive iodine seeks out the thyroid gland, and destroys and injures cells, which can lead to cancer.

Strontium-90, a radioactive pollutant released only from nuclear reactors, ends up in milk and bones, contributing to bone cancer and leukemia. Studies of Sr-90 in baby teeth found levels 30-50% higher in teeth of children living near reactors[6].

Follow-up studies find that background levels are rising with continued use of nuclear reactors with levels in the teeth of babies born in the late 1990s about 50% higher than those born in the late 1980s. Of the seven areas examined so far in the baby tooth studies, the highest Sr-90 levels have been found in southeastern Pennsylvania – around the Limerick reactor.

In addition to cancer and birth defects, evidence exists that radiation is permanently mutating the gene pool and contributing to its gradual weakening, resulting in

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[3] Fairlie, I. Childhood cancer near nuclear power stations. Environmental Health 2009, 8, 43. doi10.1186/1476-069X--43. http://www.ehjournal.net/content/8/1/43.]

[4] Jay M. Gould. The Enemy Within: The High Cost of Living near Nuclear Reactors: Breast Cancer, AIDS, Low Birthweights, and Other Radiation-induced Immune Deficiency Effects. Four Walls Eight Windows, 1996. 346 pgs http://www.questia.com/PM.qst?a=o&d=82314269

[5] Environmental Radiation from Nuclear Reactors and Childhood Cancer in Southeast Florida, Radiation and Public Health Project, 9 April 2003. Summary available at http://www10.antenna.nl/wise/index.html?http://www10.antenna.nl/wise/587/5518.html

[6] Joseph Mangano. Low Level Radiation and Immune System Damage. Published by CRC, July 29th 1998. See also Radioactive Baby Teeth: The Cancer Link. Published by Society For Human Resource Management. October 2007. ISBN-13: 9781566199094

"developmental deficiencies in the fetus, hereditary disease, accelerated aging, and such nonspecific effects as loss of immune competence" [*The New Scientist*].

The human health effects of low-level radiation exposure on workers exposed in the nuclear industry was summarized in the BEIR (Biological Effects of Ionizing Radiation) VII report [National Academy of Sciences (NAS) 2005]. The conclusions of this review indicate that carcinogenic effects of exposure increase proportionately with dose, especially regarding leukemia mortality, and that for some types of exposure the current regulatory controls in the United States may be insufficient[7].

2.2 Radioactive Waste

The nuclear chain begins with uranium mining, a polluting activity that devastates large areas. Mining and extracting uranium is also energy intensive. Uranium ore can contain as little as 500 grammes recoverable uranium per million grammes of earth.

Enormous amounts of rock have to be dug up, crushed and chemically processed to extract the uranium. The remaining wastes or 'tailings', still contain large amounts of radioactivity and are often stored in poor condition, resulting in the contamination of surface and groundwater.

Lifecycle assessments show that when uranium ore grade falls below 0.02% in the next 50 or 60 years, it would consume more energy to build uranium fuel reactors than the energy they could ever produce.

Radioactive wastes are produced continually in reactors. High-level nuclear waste (also called irradiated or "spent" fuel) is more radioactive than when the fuel rods were loaded into the reactor.

A concern is what to do with the accumulated waste such as the extremely radioactive spent fuel rods. If exposed to air for more than six hours, spent fuel rods spontaneously combust, spewing highly poisonous radioactive isotopes. This spent fuel will be hot for 10,000 years. This waste is so lethal that standing near it without shielding causes fatality within minutes. No technology exists to keep this hazardous waste isolated for long.

Irradiated fuel rods are stored in storage pools inside reactor buildings. If someone accidentally drained the water from the pool, the "spent fuel" would spontaneously burst into flame and burn out of control for days, releasing clouds of highly-radioactive material all the while. Besides this, in case of leakage, what is going to happen to the radioactively contaminated water? Where will the massive volume of water outflow?

Another type of waste is low-level radioactive waste which is all other radioactive waste from reactors. Large amounts of this waste has to be buried and over the years may leak and contaminate groundwater.

The facility at Cumbria is the world's largest stockpile of plutonium and uranium for which there is currently no use. In addition there is an ever increasing quantity of nuclear waste, which, despite billions of pounds of investment in hardware, the industry is struggling to deal with.

[7] National Academy of Sciences. 2005. Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2. Washington, DC: National Academy Press

For more than 40 years high-level liquid waste has been stored at Sellafield with constant stirring and cooling to stop radioactive elements combining and causing an explosive reaction. The UK Nuclear Installations Inspectorate (NII) has warned that these storage practices might become unsafe because of the state of the tanks. This concern was repeated in the NII's 2007 report.

There is a danger of a collapse of the tanks and also the consequences of an interruption in the 24-hour-a-day supply of electricity and water that are required to keep the tanks cool. In view of this, liquid storage of such dangerous wastes is not a permanent solution.

Waste treatment technologies that were prescribed – vitrification and evaporation – for Sellafield, were found to have underestimated the intense radiation from high level liquid wastes resulting in under-performance of the nuclear power plant itself and additional costs to build 'better' storage technologies.

2.3 Reactor Accidents and Leaks

Of all electricity generation technologies, nuclear power is one which is capable of catastrophic accidents. Any country with nuclear aspirations should consider the risk of a catastrophic accident as a major negative attribute of this technology. Does Malaysia have the capacity to deal with a catastrophic event such as a reactor meltdown or leak and whose effects may reach across space and time? Is the public willing to accept this risk when cheaper and safer energy alternatives are available?

The nuclear reactor is not the only source of serious hazard in case of accidents. The Canadian Environmental Assessment Agency (CEAA) identified three categories of accidents and malfunctions i.e.

(i) those directly involving the nuclear reactor such as serious damage to the reactor core.
(ii) conventional accidents and malfunctions that result in chemical or radioactive releases not directly involving the reactor core and may include those associated with nuclear fuel.
(iii) malevolent acts involving fires, explosions, punctures, aircraft crashes that could result from sabotage or terrorist actions.

Numerous incidents have occurred in nuclear power plants over the years without triggering a major accident. Although the probability of a nuclear explosion is minor, there is a significant risk of core meltdown and for steam and chemical explosions. This would lead to a release of a large fraction of its radioactive inventory.

For example, in 1979 a combination of technical faults and operator errors led to loss of coolant and a partial meltdown of the core of the nuclear power station at Three Mile Island in the USA where limited quantity of radiation was released.

The worst accident at a nuclear power station was at Chernobyl in the Ukraine in 1986. A combination of operator errors, inadequate safety procedures and poor reactor design led to explosions of steam and hydrogen that released vast quantities of radioactive materials over the Ukraine, Belarus and much of Europe.

Millions of people in the Northern hemisphere have suffered and will continue to suffer from the Chernobyl catastrophe due to exposure to radiation.[8]

The US Nuclear Regulatory Commission (NRC) has reported that at least 27 of America's 104 licensed reactors are now leaking radioactive tritium. The worst case is reported to be Entergy's Vermont Yankee in Pennsylvania, USA. High levels of contamination have been found in test wells around the reactor, and experts believe the Connecticut River is at serious risk.

Furthermore according to the NRC Report, a fire in the spent fuel pool reactor like Vermont Yankee which stores 488 metric tones of spent fuel, would cause 25, 000 fatalities over a distance of 800km if evacuation were 95% effective. But this evacuation rate is most impossible to achieve.

An incident in Krümmel nuclear reactor in Germany resulted in it being shut down for the second time in two years. There were also problems at the Gorleben site which was intended for long term storage of nuclear waste[9].

Nuclear facilities in France experienced a total of 115 irregularities in 2008. In July 2008, the Tricastin nuclear power station in southern France malfunctioned, resulting in 30,000 litres of a solution containing 12% enriched uranium to overflow from a reservoir into the nearby Faffiere and Lauzon rivers, raising the concentration of uranium in the two rivers 1,000 fold[10].

2.4 Water Use Harms Aquatic Life

Reactors require huge amounts of cooling water, which is why they are often located near rivers, lakes or oceans[11]. The initial devastation of marine life and ecosystems stems from the powerful intake of water into the nuclear reactor.

Marine life, ranging from fish larvae to microscopic planktonic organisms vital to the ocean ecosystem, is sucked irresistibly into the reactor cooling system. Some of these animals are killed when trapped against filters, grates, and other structures[12]. An equally huge volume of wastewater is discharged at temperatures hotter than the water into which it flows and this would also be detrimental to aquatic life.

2.5 Exorbitant Cost of Nuclear Energy

The multi-faceted costs of adopting nuclear energy as part of the nation's energy mix require close scrutiny and honest assessment. Nuclear power is the most expensive form of power and can not exist without massive subsidies. Arguments that nuclear

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[8] ECRR, Chernobyl 20 Years On; The Health Effects of the Chernobyl Accident Documents of the ECRR 2006 No 1. Chris Busby, Alexey Yablokov (eds.)

[9] Krümmel accident puts question mark over Germany's nuclear future. Spiegel Online, 13 July 2009, http://spiegel.de/international/germany/0,1518,635788,00.html

[10] Chain of accidents prompts soul searching. 27 July 2008. Spiegel Online. http://spiegel.de/international/europe/0,1518,568467,00.html

[11] Paliament of Australia. Water Requirements of Nuclear Power Stations. 4 December 2006, no. 12, 2006–07, ISSN 1449-8456.http://www.aph.gov.au/library/pubs/rn/2006-07/07rn12.pdf

[12] Licensed to Kill – How the Nuclear Power Industry destroys endangered marine wildlife and ocean habitat to save money.http://www.nirs.org/reactorwatch/licensedtokill/LiscencedtoKill.pdf

energy can be cheaper than fossil fuel sources are flawed as they are devoid of a truthful analysis of the extent of costs beyond securing the finite raw material.

As it is so expensive to build, the price of the electricity produced would be exorbitant too. Official cost estimates for nuclear power tend to neglect or downplay hidden costs from the fuel cycle, waste management, decommissioning of nuclear facilities, security, infrastructural changes and state guarantees for liabilities.

There has been deliberate omission of discussion on the exorbitant costs arising from long lead time between construction and operation, nuclear waste treatment, underwriting of liabilities by the government (debt, accidents), health impacts and decommissioning.

The economics of the nuclear power industry provided by the proponents have to be viewed with suspicions as they have vested interests in making it appear competitive.

A great deal of money has to be spent and accumulate large amounts of interest before there is any revenue. Would this cost ultimately be transferred to consumers through a price hike?

Nuclear energy would also be heavily subsidised but most of these subsidies are hidden. Documented analyses of nuclear energy programmes in most western countries such as Britain and France showed that they are heavily reliant on government subsidies and the promised cheaper energy remained largely unfulfilled.

The nuclear industry does not pay the full cost of insuring against a catastrophic accident such as in Chernobyl. Another subsidy for the industry is when the federal government normally pick ups the tab when accidents or leakages occur.

The nuclear industry and governments hide the true costs of new reactors by ignoring the legacy of highly toxic waste they would produce and decommissioning costs. Taking all aspects into consideration, nuclear power poses an economic risk that is ultimately borne by the taxpayer.

In Britain, the crisis surrounding Sellafield nuclear facility, the industry flagship for 50 years, is a good example of the irreversible, long-lasting socio-economic burden from adopting nuclear power generation as an energy source.

2.6 Exorbitant Decommissioning

In UK, the Department of Trade and Industry estimated that decommissioning costs, including the cost of running the facilities still in operation for their remaining life, were approximately £56 billion at 2003 prices, although the figure was 'almost certainly' expected to rise.

This estimate was revised in subsequent years; to £57 billion in September 2004; £63 billion in September 2005; £65 billion in March 2006; and to £73 billion in March 2007. Around £46 billion of the £73 billion is for the decommissioning and clean-up of the Sellafield site.

The Nuclear Decommissioning Authority (NDA), formed in April 2005 under the Energy Act 2004, oversees and manages the decommissioning and clean-up of the

UK's older Magnox power plants and the reprocessing facilities at Sellafield, which were transferred to its ownership from BNFL, and the former nuclear research and development facilities previously run by the UKAEA.

Magnox reactors are withdrawn from electricity privatization. The city would not buy the older stations because of looming decommissioning costs. The taxpayer is left with the bill.

In May 2008 a senior director at the Nuclear Decommissioning Authority indicated that the figure of £73 billion might increase by several billion pounds. The National Audit Office says in 2008 that it is creating an "apparently ever escalating bill" for the taxpayer.

2.7 Dangerous New Radioactive Waste

A Greenpeace report explains how reactor designers have increased hazards by using a higher "burn up" rate for nuclear fuel to extract more energy from reactors in an attempt to reduce costs and make plants more competitive[13]. This increases the hazards and costs of managing radioactive waste. The report noted that:

- The isolation period for waste from new generation reactors will increase to 2.3 million years from one million years before radioactivity approaches that of natural uranium;
- Environmental and human health consequences will significantly increase in severity if there is an accident or terrorist attack involving higher burn up nuclear fuel;
- More toxic fuel waste will increase costs of managing waste, including costs of interim storage, transportation and long-term storage in a repository; and
- Despite billions of dollars in research internationally, there is no technologically proven or universally acceptable long-term repository for fuel waste in operation anywhere in the world. The cost of repositories is speculative.

2.8 Green House Gas Emissions

The recent push for a revival of nuclear energy has been based on its claimed reduction of CO_2 emissions where it substitutes for fossil-fuelled power stations. Nuclear energy proponents state that green house gas emissions can be reduced.

Nuclear reactors, which produce energy based on the fissioning of uranium atoms, do not directly emit greenhouse gases (GHGs). Nevertheless each step of the nuclear fuel cycle - from uranium ore mining, milling, processing, fuel fabrication, reactor construction, spent fuel reprocessing to eventual decommissioning and waste storage, involves emissions, including GHG.

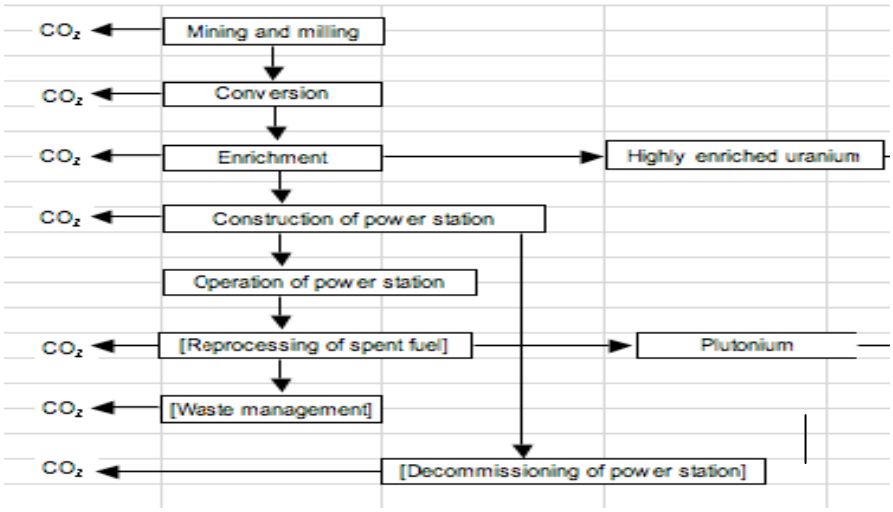
These emissions have been quantified by researchers who are independent of the nuclear industry. Early work was published by Nigel Mortimer[14]. A very detailed study

[13] Dr. Marvin Resnikoff of Radioactive Waste Management Associates. The Hazards of Generation III Reactor Fuel Wastes

[14] Mortimer, N (1991) Nuclear power and global warming, *Energy Policy* 19: 76–8, Jan-Feb

by Jan Willem Storm Van Leeuwen and Philip Smith found that the total CO_2 emissions depend sensitively on the grade of uranium ore used[15].

Figure 1. The nuclear fuel chain, showing main steps where CO_2 is emitted.



3.0 MALAYSIA'S ENERGY POLICY AND PROGRAMMES

3.1 Need Policy Coherence

Energy needs and energy generation capacity from any sources must take into account emerging energy-related policies. Since 2001, Malaysia has drawn up plans to include Renewable Energy (RE) as part of its five-fuel energy mix but with little success.

Hence, the potential of RE as a sustainable and reliable energy source has been dismissed by the promoters of nuclear energy based on selective and bias analyses on their parts.
In fact in the future, solar and wind will become Earth's dominant contributor of energy. The global photovoltaic energy production increased by a factor of about 90 and wind energy by a factor of about 10 over the last decade.

Assessment of the efforts in RE in Malaysia so far showed that initial approach of relying on market forces to drive the development of RE is unrealistic without proper and effective regulatory framework.

However, the National Renewable Energy Policy and Action Plan (to be supported by the proposed Renewable Energy Act) has identified the weaknesses thus far and proposed a comprehensive strategy to promote the growth of RE.

It called for the regulatory framework to provide for the introduction of a feed-in-tariff (FiT) which will act as a catalyst for the entry of RE power generation businesses, RE industries and R&D in RE. The introduction of Feed-in-tariff to help finance renewable energy investments is also mentioned in the 10th Malaysia Plan.

[15] Van Leeuwen, JWS & Smith, P (2005) *Can nuclear power provide energy for the future; would it solve the CO2-emission problem?* www.stormsmith.nl

The growth of RE is estimated from 1% (or 219MW) in the overall energy mix in 2011 to 5% (985MW) in 2015, 12% (4,000MW) in 2030 and 24% (21,370MW) by 2050. With the anticipated growth in RE and the relatively comfortable current reserve margin of 48% (EPU statistics), there is a real need to evaluate carefully the need to adopt nuclear generation.

3.2 Energy Efficiency Programme

One way to reduce energy consumption is by improving energy efficiency (EE) in all sectors. In fact EE is one of the objectives of the National Energy Policy that was supposed to be implemented in the Eighth Malaysia Plan.

Among the ideas were EE equipment and appliances where an EE-rating system was introduced by the Energy Commission and substantial public awareness programme was carried out.

The Malaysia Energy Centre (Pusat Tenaga Malaysia) carried out capacity-building on EE and demand-side management as well as promoted the Malaysian Industrial Energy Efficiency Improvement Programme (MIEEIP).

It was estimated then that EE would bring about savings of 1,400GWh worth RM238million over the lifetime of the implemented measures. The National Energy Efficiency Master Plan should be completed and implemented soon.

Following Prime Minister Datuk Sri Najib Tun Razak's announcement to the world at the 16th meeting of the United Nations Framework Convention on Climate Change in Copenhagen last December that Malaysia will cut 40% of its carbon emission intensity, the government has drawn up a roadmap to fulfill its promise.

Three areas have been identified – renewable energy, energy efficiency and waste management. With the implementation of this roadmap, household and industrial energy consumption is expected to be reduced considerably.

As the RE policy is carried out and RE is allowed to flourish with the right fiscal tool, it too can be expected to contribute significantly to the country's energy reserves, further negating the need for investment in costly and dirty energy like nuclear.

Besides this, energy self-sufficiency is the best guarantee of energy security. This can be achieved by a diversity of sustainable, renewable energies at medium-, small- and micro-generation scales, according to resources locally available, so that energy is used at the point of generation, saving up to 69 percent of the energy lost through long distance transport of electricity from big centralized power plants and the associated carbon emissions.

3.3 Lack Genuine Public Consultation

The government seems to have decided on the proposed nuclear energy programme as the programme was included as one of the 131 entry-point projects (EPP) of the Economic Transformation Programme unveiled to the public.

We have yet to see any meaningful debate and genuine public consultation process by the government. The public forum and debate that has been largely organised by the Malaysian Nuclear Agency is not a neutral platform to seek public opinion.

In July 2010, Minister of Energy, Green Technology and Water had said that the government will only make a final decision on nuclear energy after studying the findings of the Nuclear Power Infrastructure Development Plan scheduled for completion in 2013.

These findings should be open for public scrutiny and public opinion sought.

4.0 CONCLUSION

We reiterate that nuclear power is not necessary for Malaysia. We must improve energy efficiency and reduce high carbon activities. Worldwide, people have realized that there are safer, cheaper, renewable alternatives to nuclear such as solar and wind energy. Combining energy efficiency measures and renewable energy development would eliminate any justification for nuclear power.

Hence, we strongly urge the Malaysian government to cancel its plan of developing nuclear energy.

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