Cleaner Safer Energy?

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Japan's Double Tragedies

Japan faced its worst crisis since the Second World War after a 9.0 magnitude earthquake on 11 Mar 2011 devastated the north-east of the country and triggered a crisis at the Fukushima nuclear plant. Over the past 3 weeks, the world watched with caution and admiration of how the government and its people reacted and coped with the aftermath from the twin disasters. As the death toll continued to climb, the greatest fear that swiped across the various nations was the concern over the potential melt down of the damaged nuclear plant leading to radiation contamination.

Even though the nuclear disaster at Chernobyl happened on 26 Apr 1986, some 25 years ago, the stigma continued till this day as it was indeed the worst nuclear disaster to date with the death toll from radiation-related diseases estimated at the high range of 175,000 (the lowest estimate at 10,000). In contrast, most experts agreed that the Fukushima accident was still well away from the massive explosion that hit Chernobyl.

Witch Burning

While the Japanese tolled on containing the leak radiation from the damaged nuclear plants, many opponents of nuclear energy had reacted strongly against the planned installation of new nuclear plants across the world. According an article published by the New York Times on 26 Mar 2011, Chernobyl was still hazardous after the explosion in 1986. The structure that was constructed to contain Reactor Number 4 was known as "the sarcophagus" because deep inside it were some 180 tonnes of melted nuclear fuel and debris which burned through the floor of the reactor and hardened, in one spot, into the shape of an elephant's foot.

Besides Chernobyl, 57 nuclear-related accidents have occurred since 1986 and on average, US$332 Million awarded in damages every year for the past 30 years[1]. According to Assistant Professor Benjamin K Sovacool, unknown to many; nuclear power is one of the costliest sources of energy when the full nuclear-fuel cycle is considered. In addition, generation of nuclear energy involves some of the most dangerous elements known to humankind; including more than 100 dangerous radionuclides and carcinogens such as strontium-90, iodine-131 and caesium-137.

In addition, a nuclear plant produces 30 tons (27.2 tonnes) of waste a year and this waste can be radioactive for up to 250,000 years. The lowest available estimate for storage of 1 ton of nuclear waste is US$35,000 per year. The main problem argued Assistant Professor Sovacool is where to store the nuclear waste as even nuclear waste processed in storage casts will take at least 10,000 years to reach levels of radiation considered safe for human exposure.

On the other hand, Professor Nalapat of Manipal University of India noted that not all types of radiation are harmful and precautions can be taken against even the most harmful ones. In the US, according to Professor Nalapat, 30,000 people die each year of ill-effects associated with coal-based power generation plant. In contrast, fewer than 10 people have died because of the radiation from the Fukushima Daiichi nuclear facility in Japan, which have since become the focus of much media attention.

A prominent US writer, Gwyneth Cravens shared that the group of 226,000 workers who were active in cleaning up the Chernobyl facility surroundings "received an average body dose of 10 millisieverts, less than what they would have received from nature if they have moved … to Washington for a year". She said that studies conducted on more than

500,000 workers involved in the clean up "failed to find any correlation between the increased exposure to radiation and a rise in cancer or death rates". Ten years ago, a United Nations committee concluded that at Chernobyl, "there is no scientific evidence of increases in overall cancer incidence or mortality". The readers can find more information in the book "Power to save the world" by author Gwyneth Craven[3].

World Reaction

According to the International Energy Agency (IEA)[4], world supply of energy generated by nuclear facilities grew from 0.9% in 1973 to 5.8% in 2008. In that same period, oil generated energy fell to 33.2% in 2008 from 46.1% in 1973. Another major change in the source of energy supplies was natural gas which grew from 16% to 21.1% over the same period. In 2008, the top 5 producers of nuclear energy accounting for over two-third of the world's nuclear energy supplies were the US (30.7%), France (16.1%), Japan (9.4%), Russia (6%) and Korea (5.5%).

Being the top nuclear energy generating country in the world, President Barrack Obama has on 24 Mar 2011 approved the launch of a safety review of US nuclear reactors by a special task force under the Nuclear Regulatory Commission (NRC). The first stage of the review will include a formal reporting every 30 days for the next 3 months and the conduct of four public meetings. Elsewhere, Germany has suspended a plan to extend the lives of its nuclear power stations while China has placed a temporary halt on approvals for new nuclear facilities.

According to Professor Sir David King[5], these reactions were based on panic, not science. He was further quoted to say that "human perception of risk often does not match the facts. Nuclear power is by far the safest method of power generation per amount of electricity produced…it is worth remembering that the biggest natural disaster in central Europe for centuries, in terms of fatalities, was the summer of 2003, which caused 35,000 deaths… which was, in turn a consequence of human-induced climate change. Any perceived threats from nuclear power pale beside the very real danger of global warming." A copy of his latest report published this week entitled "A low carbon nuclear future: Economic assessment of nuclear materials and spent nuclear fuel management in the UK" can be found at the reference below.

Is nuclear safe?

In a 2010 study published by the Organisation for Economic Cooperation and Development (OECD)[6], nuclear energy is the safest of the energy sources. This was the conclusion reached after a study of accidents with five or more fatalities from a wide ranging of energy sources between 1969 and 2000, looking at both immediate and delayed deaths. The report also predicted that in OECD countries, the risk of a nuclear disaster causing more than 100 eventual deaths was a factor of 10 or more lower than the risk of an accident causing 100 immediate fatalities in the coal, oil, natural gas and hydro energy chains – and almost a factor of 1,000 lower than the risk from liquefied petroleum gas.

Earlier in Feb this year, China revealed that it was launching a safer, cleaner and cheaper network of nuclear reactors based on thorium. According to China's Academy of Sciences, the "thorium-based molten salt reactor system" was chosen because the hazardous waste will be a thousand times less than with uranium. Moreover, the system is inherently less prone to disaster". This liquid fuel idea was pioneered by US physicists at Oak Ridge National Laboratory in the 1960s but the US didn't take up the idea.

Mr Kirk Sorensen, a former NASA engineer at Teledyne Brown and a thorium expert explained that "the thorium-based molten salt reactor system has an amazing safety feature. If it begins to overheat, a little plug melts and the salts drain into a pan. There is no need for computers, or the sort of electrical pumps that were crippled by the tsunami. The reactor saves itself…. they operate at atmospheric pressure so there will

not be the sort of hydrogen explosion seen in Japan". Professor Robert Cywinksi from Huddersfield University agreed and said that "thorium must be bombarded with neutrons to drive the fission process. There is no chain reaction so fission dies the moment the photon beam is switched off and there are insufficient neutrons for it to continue of its own accord".

Ambrose Evans-Pritchard, Telegraph's International Business Editor in London wrote recently that while the world deposits hold 80 years of uranium at expected usage rates, thorium is as common as lead. The US has buried tonnes as a by-product of rare earth metals mining. Norway has so much that Oslo is planning a post-oil era where thorium might drive the country's next great phase of wealth. In this commentary published by the Today newspaper on 22 Mar 2011, he wrote that the International Atomic Energy Agency said the world currently has 442 nuclear reactors. These generate 372 gigawatts of power, providing 14% of global electricity. Nuclear power output must double over the next 20 years just to keep pace with the rise of China and India.

A newsletter published jointly by the International Energy Agency (IEA) and the OECD Nuclear Energy Agency (NEA) dated 16 Jun 2010 reported that "almost one quarter of global electricity could be generated from nuclear power by 2050, making a major contribution to cutting greenhouse gas emissions…. Nuclear energy is one of the key low-carbon energy technologies that can contribute, alongside energy efficiency, renewable energies and carbon capture and storage, to the decarbonisation of electricity supply by 2050."

George Monbiot, best-selling author of books such as "Heat: How To Stop The Planet From Burning" summed it up neatly when he wrote in The Guardian on 21 Mar 2011[7] "… there are no ideal solutions. Every energy technology carries a cost; so does the absence of energy technologies. Atomic energy has just been subjected tone of the harshest of possible tests, and the impact on people and the planet has been small. The crisis at Fukushima has converted me to the cause of nuclear power."

References:

[1] "Nuclear power comes with hidden cost", 23 Mar 2011 by Assistant Professor Benjamin K Sovacool, Lee Kuan Yew School of Public Policy

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[4] International Energy Agency: 2010 Key World Energy Statistics at http://www.iea.org/

[5] Sir David King, Director of Smith School of Enterprise and the Environment. Latest report at http://www.smithschool.ox.ac.uk/a-low-carbon-nuclear-future-economic-assessment-of-nuclear-materials-and-spent-nuclear-fuel-management-in-the-uk/

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[7] George Monbiot, Why Fukushima made me stop worrying and love nuclear power, The Guardian, 21 Mar 2011 at http://www.guardian.co.uk/commentisfree/2011/mar/21/pro-nuclear-japan-fukushima

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