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ऑफ इंडिया लिमिटेड
(भारत सरकार का उद्यम)
एनपीसीआईएल
NPCIL
NUCLEAR POWER CORPORATION
OF INDIA LIMITED
(A Govt. of India Enterprise)

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नलिनीश नगाइच
अधिशासी निदेशक (सी पी एवं सी सी)
Nalinish Nagaich
Executive Director (CP & CC)

D.O.No.NPCIL/ED(CP&CC)/2011/M/ August 30, 2011.

Dear Sir,

This is in reference to your letter to PMO received by us on August 8, 2011 related to energy scenario in India in context of the Germany's recent decision to phase out nuclear power by the year 2022.

In the current energy debate, it must be realized that India faces constraints in respect of energy resources. We have limited conventional energy resources, such as petroleum, natural gas, coal etc. Already, some coal is being imported, and we see intermittent shortages, too. As far as renewables are concerned, they are welcome, but currently they come with several riders attached – like they cannot provide base-load electricity (24x7), and there are cost issues, too, apart from deployment and logistical issues. Scaling up renewables for large-scale contribution to the energy needs of the nation would be yet another unique challenge. Thus, at best, renewable sources of energy, like wind and solar, can play a supplementary role in India's energy mix and can, no doubt, provide vital electricity in far-flung areas, especially those that are not connected to the grid.

Nuclear industry has a proven track record of safety and environment-friendliness for last 56 years worldwide. With 440 reactors in operation across the globe, 14585 reactor-years of cumulative worldwide experience over nearly six decades (as of early 2011), and with about 14% share of world's electrical power generation, nuclear power has amply demonstrated its usefulness, commercial

viability as well as exemplary safety track record. One of the compelling merits, of nuclear power amongst others, is that it does not emit carbon dioxide and other greenhouse gases and can, thus, help the world fight global warming.

It is noticeable that in the entire history of nuclear power generation over the last 56 years, there have been three major nuclear events globally (discussed below).

Let us look at the most debated events in nuclear power history from the safety point of view in order to understand and appreciate the “high safety” claim of the nuclear power industry.

TMI (1979)

The Three Mile Island unit-2 (TMI-2) accident of 1979 in USA, where at least two equipment failures were severely compounded by human errors, **two lines of defense were still not breached – essentially all of the radioactivity remained sealed in the thick steel reactor vessel, and that vessel was sealed inside the heavily reinforced concrete and steel lined "containment" building which was never even challenged.** It was clearly not a close call on disaster to the surrounding population. Indeed, the situation was immediately brought under control and **not a single life was lost in this accident**. Post-event studies lasting several years reveal no adverse health effects.

Chernobyl (1986)

In 1986, the Soviet Chernobyl reactor did not have a TMI-type containment structure and it had a graphite core. *If it had such a containment structure, then that disaster would have been averted. All modern nuclear reactors, including Indian reactors, have double containment, among several other layers of multiple safety systems, and they do not have graphite cores. In essence, a Chernobyl-type accident, under similar conditions, simply cannot happen in Indian nuclear reactors.* Post-event health studies conducted over more than two decades reveal no adverse health effects in the general population. Only a few people who took part in the initial salvage operation have been affected. In any case, *the death count attributed to acute radiation exposure is in a low double-digit number (56).*

Fukushima (2011)

The recent earthquake/tsunami **natural disaster** in Japan was a very unfortunate occurrence. However, one important fact that has emerged out of this is the resilience and safety of nuclear power. The fact that needs to be acknowledged here is that these events were managed effectively based on the inherent safety embodied in the multiple layers of the preemptive mechanisms built in those nuclear power plants. *The 13 reactors in the affected zone were automatically brought to a safe shutdown state immediately upon the earthquake, terminating the nuclear fission reaction,* and the plant facilities indeed withstood this extreme natural event of unprecedented magnitude in recent memory (9 on Richter scale). *Had this been a land-based earthquake, with no ensuing tsunami that incapacitated reactor core cooling of four reactors at Fukushima Dai-ichi plant, these units would have been back in service soon without any consequences whatsoever.* Even despite the massive tsunami with over 14-meter-high devastating waves, the damage was largely contained and the release of radioactivity remained to a minimum, both in magnitude as well as in extent. Also, there was constant information sharing in an open and transparent manner.

This, no doubt, has been a commendable show of safety of nuclear power even in the face of extreme natural events. *Actually, in the Japan disaster, there have been no deaths till date (as of mid-August 2011) directly as a result of radiation exposure either within the affected plants or in the public domain*.

Earthquake/Tsunami resilience of Indian NPPs (The KAPS and MAPS experience)

It is worth noting here that Kakrapar Atomic Power Station (KAPS) continued to operate normally during the *Bhuj earthquake of 2001* (7.6 to 7.7 Richter) even amid massive, widespread disruption to civic services and other industries and utilities. Also, during the *Indian Ocean earthquake and tsunami of*

2004, Madras Atomic Power Station (MAPS) was safely shut down without incident and it resumed operation just two days later.

A recent detailed report on 'Safety Evaluation of Indian Nuclear Power Plants, post Fukushima Accident' published in July 2011 has indicated that adequate safety mechanisms are in place at Indian NPPs, while there would be additional safety measures also implemented based on the lessons learnt from Fukushima.

Electricity: The Key Input for Growth

Electricity is a prime driver of economic growth. Any dip in electricity production can deliver a severe blow to the economic aspirations of a developing economy like ours, which is poised for a sharp growth in the coming years. More electricity means more prosperity and more work for the people. Electricity, directly and indirectly, helps create jobs and is indispensable for the modern world, powering industries, agriculture as well as our homes. Electricity also plays a key role in poverty reduction.

On Germany's Decision to Phase Out Nuclear Power

Germany's current shutdown of 7 of its 17 reactors effective from March 2011 and its later decision in May 2011 to phase out nuclear power entirely by the year 2022 must be seen in perspective.

1. Reversals of policy

A coalition government formed after the 1998 federal elections had announced the phasing out of nuclear energy as a feature of its policy. With a new government in 2009, the phase-out was cancelled. Actually, in 2009, Germany had advocated the extension of operating licenses for the country's 17 nuclear power plants, saying that nuclear power is needed as an important "bridging technology" while renewables make further advances. But in the wake of the Fukushima crisis, Germany reversed its position.

Germany is likely to face power shortages and/or costlier electricity for several years to come. It would also have to contend with the pollution that would now result from burning more coal or natural gas to make up for the power deficit.

Unlike Germany, a large majority of nations worldwide have no plans for phase-out and are further pursuing their nuclear power plants.

Some relevant quotes:

Mr. Grossmann, Chief Executive of German energy conglomerate RWE argues that until other forms of low-carbon energy improve, Germany will need nuclear power to meet its greenhouse-gas targets.

http://www.economist.com/node/18744315

French Prime Minister Francois Fillon, whose country relies on nuclear power to produce 80 percent of its electricity supply, insisted "there's no way" for the European Union to meet its emission-cutting targets without at least some nuclear power. "We respect this decision, but it doesn't cause us to change our policy," Fillon said.

http://www.cbsnews.com/stories/2011/05/30/501364/main20067387.shtml

2. Carbon dioxide emissions are a big challenge that Germany will have to face following its plans to phase out the clean and pollution-free nuclear power.

In order to implement this phase-out, Germany would now have to depend more on coal (found locally in abundance in Germany), natural gas (primarily from Russia) or imported nuclear energy (from France). Burning coal (and gas) is a polluting way to generate electricity, and would produce mountains of waste. It would also add a lot of carbon dioxide in the atmosphere – which is not an environment-friendly proposition, as it would accelerate global warming.

Nuclear power, on the other hand, doesn’t emit the harmful carbon dioxide and other harmful greenhouse gases, and generates extremely small amount of waste that can be stored on site safely. What is more in favour of nuclear is that the used fuel (also called spent fuel) can also be further reprocessed to extract the new fissile material (freshly formed fuel) generated in the previous nuclear fuel cycle, useful in producing more electricity later.

3. Renewable energy will take years to catch up; even then, cost could be an issue

In the meanwhile, Germany has declared plans to gradually raise the contribution from renewables. They have plans that would require renewables to fill up 20% of the nation's energy needs by 2020, which seems a tall order. This is because 20% of 2020 is substantially greater in absolute amount than today's 17% (the share of renewables in Germany in 2010), especially since it will then also have to make up for the gap left wide open by the nuclear's phase-out (Germany obtained nearly 25% of electricity from nuclear power in 2010). And even if this is achieved on time, it will then barely put Germany where it is today in terms of energy production. Moreover, there would be less electricity produced on cloudy and less windy days. Renewables will require years to build up capacity, and even then, consumers face the prospect of costly electricity.

Currently, German energy subsidies are about 17 billion Euros (Rs.1,12,200 crores). The subsidies for wind energy are 5 (Rs.3.30) and 12 (Rs.8) Euro cents/kWh for on-shore and off-shore wind energy farms. The subsidies for solar and biomass power are 28 Euro cents (Rs.18)/kWh and 17 Euro cents (Rs.11)/kWh respectively. While these subsidies are met from taxes on nuclear fuel of 145 Euro (Rs.9,570)/gram, the remaining subsidy is passed on to consumers (3.5(Rs.2.30) to 6 Eurocents (Rs.3.96)/kWh) and the general budget. With closure of nuclear power, the tax from it will not be available, leading further burdening of the consumers and the taxpayers.

Nuclear, on the other hand, provides reliable, clean and cost-effective electricity. Units-1&2 of Tarapur Atomic Power Station (TAPS-1&2) continue to serve the nation even after 42 years of their inception, while producing a unit of electricity for less than one rupee. Newer plants, too, are cost-competitive with other technologies.

4. Germany vs. India: Not an apple-to-apple comparison [More like apple-to-orange]

The decisions related to power generation are country-specific and, therefore, ought to be seen in this perspective. Germany has a population of 83

million, whereas that of India is 1200 million ***and rising***. What's more, Germany (like any economically advanced nation) has already reached a high level of per-capita electricity usage (6300 kWh), while India has a very low per-capita electricity consumption of about 700 kWh, which is bound to rise sharply in the coming years. Increase in electricity generation, therefore, must match the pace our developmental goals. A failure to add power generation quickly could hurt a developing country like us much more than a developed country in comparison.

Germany has several energy options, the most important being import of electricity including nuclear from France, Czech Republic etc. to meet the shortfall caused by shutdown of nuclear power, given its location and the existing European electricity market. India on the other hand, with its huge and growing demand and location has no option but to deploy all sources of electricity generation optimally.

Let us also not forget that we must add as much power on our grids as possible, and rather quickly, using a clean, pollution-free, non-carbon route. And nuclear helps us achieve that vision.

With regards,

Yours sincerely,

Nagaich 30/8/2011

(N. Nagaich)

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