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ENERGY OPTIONS FOR BANGLADESH

Nuclear Power: Panacea or Peril?

The proposed use of nuclear power raises a number of extremely serious technological and ethical concerns, and can have potentially catastrophic consequences. However, with meager energy resources, can Bangladesh afford to exclude nuclear power for all time, especially with its significantly lower fuel cost than other sources of energy?

by Dr Ahmed Badruzzaman

Civilian nuclear plants offer an energy alternative to countries such as Bangladesh with scarce energy resources. The concept of commercial nuclear power is fairly simple although the technology is very complex and challenging. The energy is produced by splitting (or fission) of the atomic nuclei of certain heavy elements such as Uranium, Thorium, or Plutonium, in a controlled manner in a reactor. The energy that holds the atomic nucleus together is released in the form of heat which is used to produce steam that is then converted to electricity.

There are no nuclear power plants in Bangladesh despite the interest expressed by successive governments to acquire such a plant even before the country became independent. However, there is an effort underway to resurrect the Rooppur nuclear project in Pabna first proposed in 1962. Pakistan has one nuclear power plant in operation and India has several. In the US there are nearly 70 large nuclear plants producing approximately 21 per cent of the electricity. In France nearly 77 per cent of the electricity is from the nuclear source. South Korea and Japan respectively produce nearly 36 per cent and 34 per cent of their electricity from nuclear plants.

Advantages

Ideally, nuclear power offers the promise of almost limitless energy. Only a small amount of nuclear fuel is needed to produce the energy equivalent of much larger amounts of other fuels. For example, in energy content, one pound of fissionable uranium fuel can replace 2.8 million pounds of 13,000 Btu/lb. coal. Although much has happened since the early optimistic days to dampen the enthusiasm for nuclear power, the production cost of electricity from nuclear power plants is still very competitive with that of oil and gas in countries where all three energy options are available. For example, in 1996, the electricity production cost per kilowatt-hour (kWh) in the US from nuclear was 46 per cent of that for oil and 57 per cent of that for natural gas. Only the electricity production cost using coal was similar to that for nuclear. It should be noted that the US has a large coal

reserve.

Introduction of nuclear power will lead to technology growth in other areas such as detection and monitoring that can be used for environmental monitoring, radioisotope development for medical applications, electronics, and computational sciences.

Nuclear energy causes no air pollution or acid rain that result from other fuel sources. In addition, with a heightened concern for global warming from burning fossil fuels or traditional fuels, nuclear power, with no emission of greenhouse gases, is often proposed as a 'greener' energy alternative. However, nuclear power faces formidable challenges of its own, as discussed next.

Disadvantages

Economics and Technology: While cost of nuclear power can be very competitive with that of other fuels, nuclear plants are very expensive to build, with the amount ranging from US \$500 million to over US \$2 billion. The estimated cost of the proposed 600 Mwe (megawatt electric) Rooppur plant is nearly US \$1 billion. Cost overruns are common for nuclear power plants. For example, initial estimate for the Shoreham nuclear plant in Long Island, New York, was \$400 million; it ended up costing over \$4 billion! The plant was never put into production due to potential safety concerns. This is discussed later.

A large number of nuclear plants will be needed to achieve an advanced economy using the nuclear option in Bangladesh. For example, more than three Rooppur-size plants will be needed to sustain the per capita GNP of Pakistan while over 30 such plants will be needed to sustain that of Japan.

Infrastructure to build or utilize nuclear plants is non-existent in Bangladesh. The country does not have appreciable amounts of uranium ore that can be mined to make nuclear fuel and no technological base to fabricate such fuel even if uranium is found. Bangladesh is unlikely to get either a uranium enrichment plant needed for the fuel design for reactors from the US or Europe or a heavy water production plant for the Canadian fuel design. Thus, the coun-

try would have to import nuclear fuel just as she now imports oil.

Even if all of the above circumstances were favourable, the twin issues of safety and radioactive waste disposal that have dogged nuclear power in the West will be even more challenging for Bangladesh. These are discussed next.

Safety: Nuclear power plants have a generally acceptable safety record. The number of people killed or injured from civilian nuclear power generation has been small compared to that from power generation using fossil fuels. However, the 1979 accident in a unit of the Three Mile Island plant in Pennsylvania and the 1986 accident in the Chernobyl plant in Ukraine illustrate the potential feature of Western nuclear power. The containment building of the Three Mile Island plant, an essential feature of Western nuclear power plant designs, was able to prevent the radioactivity from the 1979 accident reaching outside its confines. As a result, workers, and the public were not exposed to harmful levels of radiation from this accident. However, the unit with its melted, highly radioactive reactor core remains a source of concern.

The Chernobyl reactor in Ukraine had no containment building and dangerous levels of radioactivity from the accident spread across much of Europe. Thirty people were killed from high radiation levels in towns nearby. Many were permanently relocated from there. Soil and plants across Europe were contaminated with radioactivity that then passed on to milk, fruits, and vegetables. Such an accident can be catastrophic in a densely populated country like Bangladesh, especially with no financial, technical, and transportation

resources to handle the events and its aftermath. In a country already overcrowded, there will be no place to evacuate to.

The idle, four billion dollar Shoreham nuclear plant in Long Island, New York that we mentioned previously, is a reminder of the consequences of disregarding these concerns. Despite strong opposition from the public and the State of New York, the US Nuclear Regulatory Commission allowed the operator to perform start-up tests thereby making the reactor core radioactive. However, situated only a few miles from New York City, with no credible and viable routes to evacuate millions of people in the event of a nuclear accident, the plant was ultimately not allowed to go into full operation. Meanwhile, the plant with its radioactive core needs to be monitored and guarded. Can Bangladesh afford such an expensive experimentation and a monument?

Finally, on the issue of safety it must be noted that despite multiple redundant safety features, nuclear power technology is very sensitive and unforgiving to human error or mechanical failure. In the 1979 Three Mile Island accident in Pennsylvania, the operator on duty misinterpreted the instrumentation and turned the emergency cooling system off, leaving the hot reactor core without cooling and causing it to melt.

Disposal of Radioactive Waste: Although Bangladesh is unlikely to be asked to dispose of its high-level radioactive waste, its generation will contribute to a global problem and thus must be considered. Highly radioactive waste is produced from using nuclear fuel. It includes isotopes that remain hazardous for thousands to millions of years. Safe disposal or storage of such waste products is a contentious issue and is unresolved even in developed

countries that have large nuclear power programmes. Some radioactive materials in large amounts can be instantly lethal. Radioactivity can cause cancers and birth defects for generations. A 1993 research paper from the University of California at Berkeley showed that long-lived, soluble fission products could contaminate the groundwater near proposed waste repositories.

Currently, there are no agreed upon plans for permanent disposal of radioactive waste. In the US, spent nuclear fuel assemblies from civilian nuclear power plants, with their highly radioactive contaminants, are being stored at plant sites. The current inventory at these sites totals 40,000 tons and it is growing. This has raised a serious concern among scientists and the public.

A landmark 1974 US Department of Energy (US DOE) study examined potential methods for permanent disposal of high-level radioactive waste. Three of these are discussed next. Each disposal option raises a number of serious issues.

The most favoured disposal technique was burying the waste in geological formations that have remained dry for millions of years with little possibility of the waste coming in contact with groundwater. However, the likelihood of containing radioactive waste for millions of years in underground facilities or in geological formations and safeguarding it against terrorist entry are uncertain. The potential for the waste reaching a groundwater system, especially if weather patterns change, not an unlikely phenomenon over such a long time is also a serious concern.

Another disposal option in the US DOE study would allow sealed canisters of high-level nuclear waste to melt their way

to the bottom of the Antarctic ice sheet. However, the report found this option to be even more perilous. The heat generated by the waste in the canisters would create pools of water underneath the ice sheet. In time, enough water may be formed to loosen the continent-size ice sheet from the underlying rock and carry it to the ocean. This will raise ocean levels to possibly submerge coastal cities such as Los Angeles. Catastrophic weather changes may ensue.

A third disposal option studied was launching the waste towards the sun using rockets. For weight considerations, only the highly radioactive waste, a small fraction of the total volume, can be sent this way. However, with a growing amount of waste, a large number of rocket launches would be required. Rockets occasionally blow-up in flight, as happened in the space shuttle Challenger disaster of 1986 when the rocket transporting the shuttle exploded within minutes of leaving the launch pad in Florida, killing the astronauts aboard, and spreading the debris over a large area. The potential for massive radioactive contamination is obvious if rockets are used to carry radioactive waste into space.

Highly radioactive isotopes are not the only source of concern. In any nuclear-related activity, whether it is for power plants, weapons, or for medical applications, all materials that come in contact with radioactivity are also contaminated and must be treated as radioactive waste. This includes gloves used by workers, clothing, equipment, etc. Nearly 90 per cent of the nuclear waste volume generated in the US contains low to medium-level radioactivity.

In addition to technical chal-

lenges, radioactive waste disposal raises a number of ethical issues. As seen from the Chernobyl disaster in Ukraine, radioactivity does not respect national boundaries. Radiation can initiate genetic defects that propagate into generations of children yet to be born. We would burden our future generations with an almost unmanageable problem if we left behind a waste product that would remain hazardous for thousands to millions of years.

In view of the above technological and ethical issues, public acceptance of radioactive waste disposal has remained elusive in the West. Even the disposal of low and medium level waste has raised a public outcry, such as the debate that followed the recently approved pilot project in Carlsbad, New Mexico, for storing such material. Voters have rejected attempts to open such a waste disposal site in Ward Valley, California. The US Congress is yet to approve a proposed high-level waste disposal facility in the deserts of Nevada. Britain and the US are accepting nuclear waste from some developing countries. This has raised public debate on the issue.

The International Atomic Energy Agency (IAEA) has developed a technological position on disposing of radioactive waste in developing countries. These mirror the geological disposal option of the US study. However, technological and ethical issues discussed here remain the same.

Institutional and Cultural Challenges: Nuclear plants demand a high-level individual and institutional vigilance and a very stringent regulatory framework. In the present set-up in Bangladesh, the Atomic Energy Commission is likely to both promote and regulate the use of nuclear power. In the US the Atomic Energy Commission was split into two separate, independent entities, namely, the Energy Research and Development Agency (ERDA) and the Nuclear Regulatory Commission (NRC). The ERDA later evolved into the Department of Energy. Would Bangladesh be able to set up a regulatory agency that is not dominated by nuclear power enthusiasts? Will such a commission be able to devise and enforce a strict regime of regulations

and punish the plant owner, which in Bangladesh will be another government entity? Nuclear plant owners in the US are mostly private companies.

In addition to the institutional framework, nuclear plant workers and owners would have to develop a culture of fearless devotion to safety and strict accountability for lapses. In addition to the obvious high level of technical knowledge and training they will need. Would a plant worker by willing to report lapses by a supervisor or the plant owner without submitting to obvious demands that could be made for concealment? Nuclear plant safety is more than institutions, regulations, training, and mechanical safeguards. It requires an evaluation to a level of safety consciousness unmatched in any other technology. Is Bangladesh prepared for it?

Safeguards: Nuclear plants are very sensitive installations that need round the clock safeguarding from terrorism and theft of nuclear materials that could cause great harm if it fell in the wrong hands.

A Dilemma for Bangladesh?

True, the proposed use of nuclear power raises a number of extremely serious technological and ethical concerns, and can have potentially catastrophic consequences. However, with meager energy resources, can Bangladesh afford to exclude nuclear power for all time, especially with its significantly lower fuel cost than other sources of energy? By doing so, would one be condemning millions to a life of continued poverty, deprivation, and ultimately a slow death? Will that be less disastrous than the spectre of a nuclear catastrophe and highly dangerous waste left for generations to come? Both sides of these questions must be weighed carefully in this debate. We believe there should be no rush to build nuclear power plants in Bangladesh at this time.

The author is Coordinator of Bangla Energy Forum. Opinions expressed are his personal and not intended to reflect those of the organisations he is or has been affiliated with.

Next: Coal, Renewable Energy Sources, and Conservation.

Managing Macroeconomics for Better Health Development

It is perhaps now time to come out of the debate and put appropriate policy and strategy framework in place for both economic and health development together and simultaneously. In fact, the most appropriate strategy for a third world country like ours should be to address the whole issue of economic and health development in a package.

by Dr. Khalilur Rahman

Macroeconomic environment has implications for health sector. It is increasingly being acknowledged that macroeconomic policies and adjustment programmes like elimination of inflation, unemployment, government budget deficits, trade balance deficits or unsustainable international debt levels etc., have direct or indirect effects on health sector by means of cutting government expenditure on health and also through the private sector intervention in health. Often corrective measures like stabilisation and structural adjustment programmes undertaken in many developing countries, have been found to have adverse consequences for the health status of their population. On the other hand, evidences indicate that countries with better health indicators are also better off in terms of their per capita income, population and other economic and social parameters.

Against this backdrop, WHO Director-General Dr. Gro Harlem Brundtland, launched a new International Commission on Macroeconomics and Health in January 2000, thirteen years after a UN Commission led by her, in her capacity that time around as the Prime Minister of Norway, established the indisputable link between environment and development. The new WHO expert Commission chaired by renowned economist Harvard Professor Dr. Jeffrey Sachs, would clarify the economic links between health and poverty reduction and recommend a set of measures designed to maximise the poverty reduction and economic development benefits of health sector development. The launching of the Commission

reminded me of the "keynote" address by Nobel Laureate Professor Amartya Sen at the 52nd World Health Assembly in May 1999 in Geneva. His topic was "Health in Development".

Professor Sen concluded, inter alia, that "good health is an integral part of good development". "Healthy people can more easily earn an income, and people with a higher income can more easily seek medical care, have better nutrition, and have the freedom to lead healthier lives". "growth-mediated enhancement of health achievement goes well beyond mere expansion of the rate of economic growth", "even when an economy is poor, major health improvements can be achieved through using the available resources in a socially productive way", "since health care is a very labour-intensive process, low-wage economies have a relative advantage in putting more, not less, focus on health care" and "the issue of social allocation of economic resources cannot be separated from the role of participatory politics and the reach of informed public discussion".

Although the above observations by the Nobel Laureate Professor do not leave any scope for any further explanation as to how health and development are inextricably linked for a labour intensive country like ours, just for the sake of relating the issue to our context, some more discussion may not be unwarranted and undesired.

In view of the results of numerous studies on linkage between health and economy, it can generally be said that the labour intensive third world countries have greater opportunity to improve the health status of their populations by enhancing quantity and

quality of labour. The increase in quantity and quality of labour can have significant impacts not only on health sector, but also on various other sectors of the economy. Good health, on the other hand, is a pre-requisite to quantitative and qualitative labour. Only a healthy and educated workforce can make best use of available scarce resources like land, equipment and other infrastructure and can facilitate faster economic growth resulting in increase in resources of households, enterprises, governments and the society as a whole. This growth can then be used to foster health development not only by allocating more resources to health services, but also to other health determinant sectors like education, nutrition, safe water supply, sanitation, child and women development, promotion of human rights, housing etc. All this would again in return lead to further economic prosperity. Thus a 'Healthy Cycle' of economy can be promoted and ensured.

Income distribution across the society, in particular, among the weaker section of the population, is an important element in its own right for improved health status of the whole population. Economic growth alone cannot ensure condition for improving health status of the poor unless minimum equity is ensured in income distribution policy. Uni-

versal education has a role in it since it can contribute to income generation and its distribution.

Relating health to economy is important and a macroeconomic approach to health development is of further importance to clearly identify the invisible but inextricable linkage between the overall macroeconomic environment and health, to forecast on the possibility and quality of the access to healthcare services by the most vulnerable section of the population and to map out resources required for health.

The need for macroeconomic management and analysis for better health outcome is, however, yet to be fully appreciated by the policy makers in the third world countries. The development planners in country like ours are mostly preoccupied by lopsided development plans and policies without taking into due consideration the underlying determinants and factors that have implications for them. A close cooperation and coordination is needed between economic and health planners to ensure both macroeconomic stability and health development. Development planners need to appreciate the intricacies and inter-link of the functioning of health and other health determinant sectors for speedy and sustainable economic and health development. Macroeconomic approach provides the opportunity to the policy

makers to act appropriately by displaying the linkages between economy and health, anticipating and identifying problems of access to health care services by the most vulnerable section of the population and presenting a comprehensive view of the available resources for health.

Political dimensions of the economic and development plans is to be carefully addressed since it can cast its shadow over health development by focussing on misplaced priorities for short-term political gain. Public health experts argue that better health can create better economy by putting health before economy; while the economic policy makers, especially in developing world, place economic development ahead of health development. The debate continues. It is perhaps now time to come out of the debate and put appropriate policy and strategy framework in place for both economic and health development together and simultaneously. In fact, the most appropriate strategy for a third world country like ours should be to address the whole issue of economic and health development in a package.

None can be ensured without addressing or underplaying the other. Education can again play an important role in the whole process of economic and health development. In fact, we need to ensure health and education

perspectives in all our development planning and programme. Intersectoral collaboration and coordination within the government is a pre-requisite to sustainable development of the country.

Professor Sen, in the concluding remark in his keynote address under reference, also laid emphasis on "informed public discussion" and the participation of the people in pressing for changes for protection of lives and liberties. Here perhaps, as I understand, he refers to the role of the civil society in social mobilization in a true participatory democracy and thus comes the issue of involving the civil society in the whole development process. Their invaluable role in and contribution to social and economic development cannot be ignored and underplayed. NGOs can play an important role in complementing government's efforts in managing macroeconomic environment for better health outcomes.

A friendly and congenial environment needs to be created between the government and the civil society, in particular with the NGOs for meaningful and supportive partnership and complementarity. While government needs not view the NGOs as contenders, NGOs should not fear that government would use and control them. Mutual confidence should be built between these two actors of development.

In an economy like ours, pov-

erty reduction is an important area in its own right in macroeconomic management. Poverty reduction, employment and income generation and distribution are important ingredients of macroeconomic management. Education, directly or indirectly also plays a crucial role in the whole process. Nexus between poverty and health is also documented.

Indeed, poverty is considered the root-cause of ill health. NGOs have been doing a great service all over the world, including, in our country in poverty reduction and thereby eliminating the cause of ill-health. Their poverty reduction programme, "microcredit" in particular, has been a success. Over the past few years, studies suggest income erosion of the microcredit borrowers because of spending on health from this income. This trend can lead to setback of microcredit operation. In order to counter this negative trend and to sustain microcredit operation, some NGOs have introduced their own sort of "health insurance" programme at a minimum premium. Thus, these NGOs are trying to contribute to economic development in two ways: by reducing poverty through microcredit operation and by directly targeting diseases through their newly launched health programmes that are, in turn, contributing to economic growth. Perhaps this is the area where NGOs, WHO and government can work together.

NGOs efforts to sustain their microcredit operation through health programmes can be supported and supplemented by both government and WHO. WHO's new Commission on Macroeconomics and Health may carefully examine the possibility of WHO's involvement in this type of

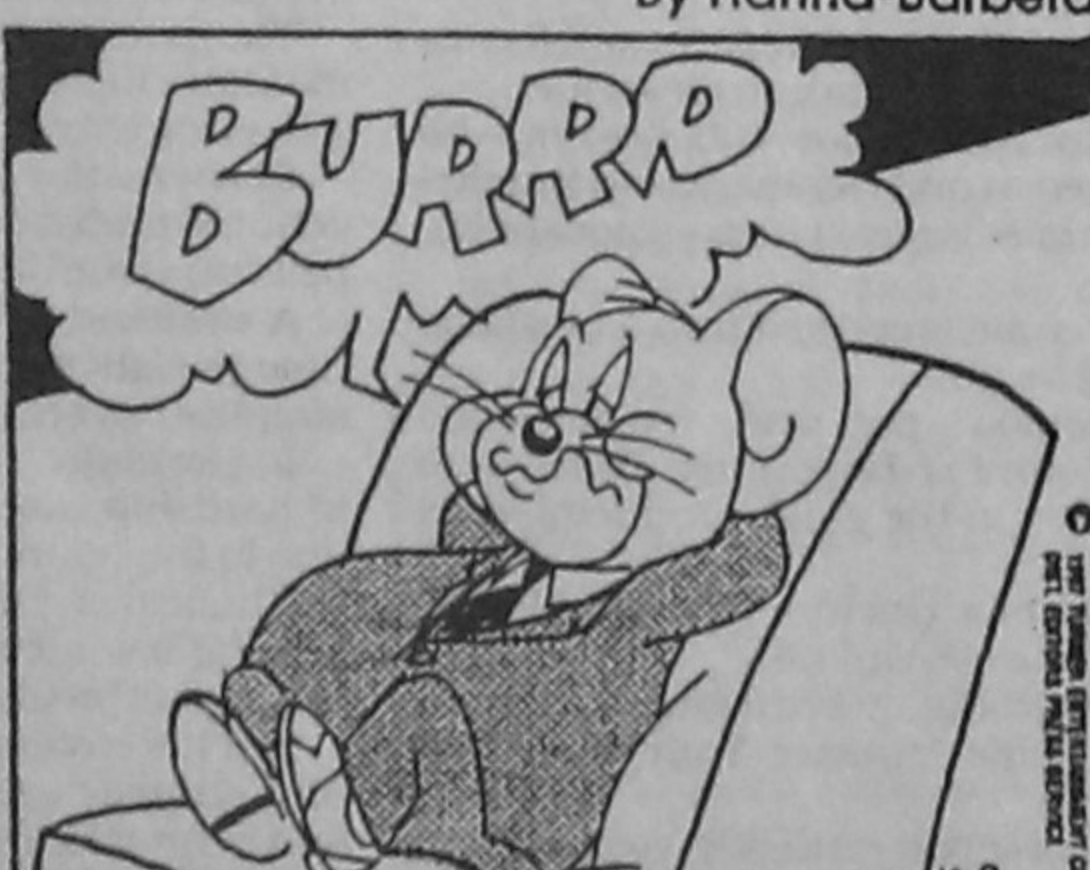
programmes for sustainable health and economic development in third world countries. WHO's new strategy for collaboration with NGOs is also supportive of the idea of WHO-NGO Government partnership at the country level. If I am not mistaken, currently, only around 3.5 per cent of GDP is spent in the health sector in our country. For speedy and sustained economic growth of the country, more investment in health and education is desirable and required.

Our current economy perhaps can also afford enhanced allocation to these important social sectors. Even within this limited resource base, reallocation can and should be done by eliminating misplaced priorities for enhanced allocation to all productive and social sectors. This is also currently the recommendation of the donor community.

Time is perhaps ripe to go by the old proverb "health is wealth". We also need to appreciate the fact that health is no less than FDI that the countries in the third world, including ours, are competing for. Our national health policy should highlight the role health sector can play not only in improving the health status of the people, but also in flourishing the economy. Likewise, our development policy should also acknowledge the significant contribution health sector can make to the economy and to the overall social development of the country. Appropriate steps are to be duly taken in recognition to these unrefutable facts in the overall interest of the nation.

The writer is a Director in the Ministry of Foreign Affairs. Views expressed in the article are entirely his own.

TOM & JERRY



By Hanna-Barbera

