Urgency of nuclear power in Bangladesh

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FOLLOWING the statement of G-7 countries in April, favouring nuclear power electricity as one of the three options for energy diversification, energy efficiency, and energy security, and to address climate change (nuclear power stations do not emit greenhouse gases, especially C02), there has been a softening of attitude towards nuclear power both in the developed and the developing countries. Recently, a number of articles supporting nuclear power in Bangladesh have appeared in the press.

This is not unexpected, because the country is facing an acute power crisis, and existing conventional resources (gas and coal) will not be able to meet the growing demands for electricity. Let me be more specific.

At present, we have an estimated shortage of 1500-2000 MW in the national grid, and we are trying hard not only to meet the shortage in 2-3 years but also to achieve the target of the projected demand based on Base Case GDP. The historical GDP growth from 1994-2004 was a little over 5%, while the projected growth from 2005-2025 are 5.2%, 8% and 4.5% in Base Case, High Case and Low Case respectively.

Power System Master Plan (PSMP) shows the Base, High and Low Case net power generation and peak load forecasts, as given in Table 1.

Using the Base Case scenario, the power sector will consume two-thirds (9.6 tcf) of the remaining 15 tcf of proven and probable gas reserves by 2025, unless coal takes over the generation seriously from 2010. According to the Draft National Energy Policy (prepared by UNDP in March, 2006) for a limited Gas-Early Coal alternative, 1500 MW of new coal-fired power will have to be generated by 2015, and 10,000MW (over half the total additions) by 2026.

It may be mentioned that, according to the PSMP, 2006, 4000 MW of coal fired stations could be operated by domestic coal and for the remaining 6000 MW, coal has to be imported for their projected power generation upto 2025.

Table 1 Net Power Generation and Net Peak Load Forecasts

	Base Case		High Case		Low Case		
Fiscal Year	Net Generation (GWh)	Net Peak load (MW)	Net Generation (GWh)	Net Peak load (MW)	Net Generation (GWh)	Net Peak load (MW)	Projected Load factor
2005	21,964	4,308	22,336	4,381	21,964	4,308	58.2%
2006	23,945	4,693	24,692	4,839	23,611	4,627	58.2%
2007	26,106	5.112	27,297	5,345	25,382	4,970	58,3%
2008	28,461	5.569	30,177	5,904	27,286	5,339	58.3%
2009	31,028	6,066	33,592	7,355	29,33	5,734	58.3%
2010	33,828	6,608	37,652	7,355	31,533	6,160	58.4%
2011	36,622	7,148	42,202	8,237	33,659	6,569	58.5%
2012	39,637	7,732	47,627	9,288	35,928	7,007	58..5%
2013	42,922	8,364	53,749	10,473	38,351	7,473	58.6%
2014	46,467	9,047	60,659	11,810	40.937	7,970	58.6%
2015	50.306	9,786	68,924	13,408	43,697	8,501	58.7%
2016	54,079	10,512	78,316	15,223	46,643	9,066	58.7%
2017	58,135	11,291	88,384	17,166	49,788	9,670	58.8%
2018	62,496	12,128	99,746	19,357	53,145	10,313	58.8%
2019	67,183	13,027	112,568	21,827	56,728	11,000	58.9%
2020	72,222	13,993	126,172	24,445	60,553	11,732	58.9%
2021	77,092	14,924	141,419	27,377	64,178	12,424	59.0%
2022	82,290	15,917	158,510	30,661	68,020	13,157	59.0%
2023	87,839	16,977	176,448	34,103	72,092	13,934	59.1%
2024	93,761	18,1`07	196,415	37,931	76,408	14,756	59.1%
2025	100.083	19,312	217,137	41,899	80,982	15,626	59.2%

Table-2 Years of Uranium Availability for Nuclear Power

Reactor/fuel cycle	Years of 2004 world nuclear electricity generation with identified conventional resources	Years of 2004 world nuclear electricity generation with total conventional resources	Years of 2004 world nuclear electricity generation with total conventional and unconventional resources
Current once-through fuel cycle with light- water reactors	85	270	675
Pure fast-reactor fuel cycle with recycling	5,000-6,000	16,000-19,000	40,000-47,000

According to this generation mix over the twenty-year planning period (upto 2025), the limited Gas-Early Coal Case substitutes 124 million tons of coal for 2.3 tcf of gas. With the present controversy about the use of coal for power production, it is highly unlikely that the target of coal-fired generation, even as estimated by Power System Master Plan, will be achieved.

It has to be remembered that for the purpose of planning, only recoverable coal reserve and their actual recovery has to be considered, not to speak of required imported coal. Just to give an example, Barapukuria has a coal reserve of 300-450 million tons, but the recoverable reserve (estimated so far) is only 64 million tons (44.8 MTOE). The actual recovery at present is 2400 tons/day, which is expected to rise to 2700 tons soon and, ultimately, to 3300 tons/day (in two phases), which can support a power station of 300 MW only.

It is, therefore, essential that, not only for energy security but also to meet our projected power requirements, alternative sources for producing electricity have to be considered. Keeping fuel cost and environmental considerations in mind, we should not consider any form of liquid fuel for power generation.

This leaves us with renewable energy and nuclear power as the only alternatives. As for renewable energy, the power generated could be utilized locally in remote non-grid areas, and even in grid areas where distribution lines could not be reached to the consumer for various reasons. Although this will serve a large enough local population, the amount is too marginal to be considered for the national grid.

Thus, the earlier nuclear power is introduced the better. Nuclear power is environment friendly, there is no gaseous pollution, liquid waste is limited, and the problem of solid waste disposal is solvable (in fact, it becomes very much easier if the spent fuel is sent back to the supplying country).

The issues of safety and safeguards have already been taken in hand by the Bangladesh Atomic Energy Commission (BAEC), with the help of the International Atomic Energy Agency (IAEA). With the present known technology, it will take 6-7 years to build a nuclear power station after considering all issues (esp. site licensing, which needs the latest site survey report).

With the present preparations of BAEC and the government, and additional urgent efforts, the first pouring of the concrete for a nuclear power station could only be made by the end of December, 2008 or early 2009, which means that nuclear power will not be available to the grid before 2014 at the earliest.

After the first nuclear power station is built, the following ones could be in stream in regular succession. There is, therefore, a need for a long-term plan and program for nuclear power at least upto 2030. It may be mentioned that China plans to build nuclear power stations totalling 20000 MW by 2020. Iran's program is also the same, although its first nuclear power station is yet to be completed (information upto January).

According to an IAEA report in 2006, with over 3000 MW nuclear power from 15 power reactors running, India's goal is to increase nuclear capacity by a factor of 10 by 2022, and a factor of 90 (?) by 2052. No wonder they are in a hurry to import fuel from the US.

The key issues for successful implementation of a nuclear power program are economics, safety and fuel. Cost estimates from seven recent studies by different countries and expert groups show that levelised cost of power generation form nuclear source is comparable to those from gas and coal. Figure 1 shows the cost range as given in an IAEA report of 2006.

Fig 1. The ranges of levelised costs associated with new construction, as estimated in seven recent studies for electricity generating technologies in different countries.

The cost of nuclear generation is low because the high investment cost is made up by low fuel cost over a long period. That is why a nuclear power plant is used as a base load station. Rooppur was selected as the site of the first nuclear station, as it is located at the western end of the East-West interconnector, to minimize transmission loss.

In this connection, it may be mentioned that the lifetime of a nuclear power station (the nuclear portion) is more than 50 years, thus improving the generation cost. If the lifetime estimate is extended to 70 years (as has been the case in the award of a licence for a nuclear station in USA recently), then even the decommissioning cost can be included in calculating the generation cost.

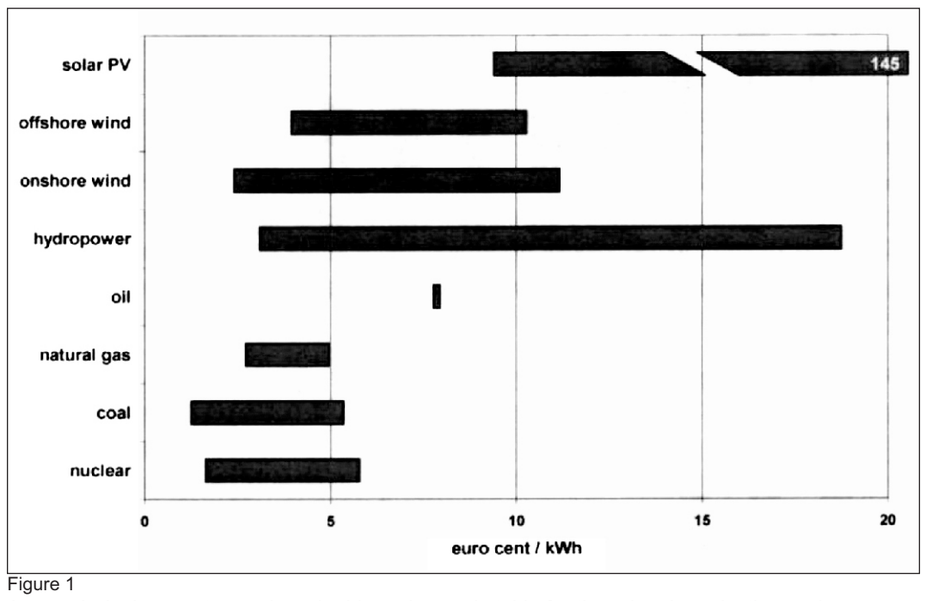

Figure 1

The cost of nuclear power generation given in the PSMP (2006) appears exaggerated, probably due to estimated high equipment and construction cost, O&M cost, plus lower lifetime assumed for nuclear plant. The initial funding of the first nuclear power station should maximise local participation (e.g. civil works), which could be met from the government's own exchequer within the framework of a turn-key project.

For the rest, some investment by the project awardee and soft long-term loan should be sought. Preference should be given to tested (off-the-shelf) designs to save construction time and, thus, reduce interest during construction. As for safety, in 11991 reactor-years of operation, there was only one accident with major off-site consequences (Chernobyl, 1986).

It is known that the safety design for the Chernobyl power station was defective. Major changes have now been made in the safety design of power reactors. The "safety culture" is constantly improving and, with 441 nuclear power reactors totaling 368264 MW operating and producing 2626 TW-h of electricity, there has been no nuclear power accident since Chernobyl (IAEA report, 2006).

It is the fuel cost and availability that need careful planning. The cost of primary fuel, which had been low and stable for the previous decade and a half, is climbing. Uranium production has been well below consumption for about 15 years, and the current price reflects the growing perception that secondary sources (e.g. reprocessed spent fuel, enriched uranium etc.) are also getting exhausted.

Fortunately, there are plenty of uranium and thorium (fertile fuel) reserves in the world, reprocessing and enrichment plants (upto power reactor grade fuel) are increasing and there are prospects of fuel from pure fast-reactor fuel cycle with recycling. These will meet the fuel requirements for the foreseeable and distant future (as given in Table-2).

Bangladesh is committed to peaceful uses of atomic energy, and has made excellent progress in the application of atomic science and technology in the fields of medicine, agriculture, industry, isotope hydrology, and radiation safety and monitoring.

A 3MW(t) research reactor is running satisfactorily since 1986, producing some radioisotopes for medical and other uses and training persons in reactor operation and safety, thanks to the dedicated activities of nuclear scientists and engineers in BAEC. The Institute of Nuclear Agriculture (INA) was originally established by BAEC and is now running well in the Agriculture Ministry. The country has, however not been able to make any headway in the nuclear power program, although efforts started from the early sixties.

The history of missed opportunities in nuclear power production is really unfortunate (an article on this by the author was published in the Monthly Guardian in October, 2003). Meanwhile, BAEC has strengthened its physical and manpower infrastructure and increased its collaboration with IAEA, RCA (Regional Cooperation for Asia), and some countries.

The Nuclear Safety and Radiation Control Act is also in force, and the country is now ready to forge ahead in nuclear power. Political will is also there, with the acquired land measuring about 250 acres and some incomplete residential buildings in a separate 12-acre land in Rooppur as physical testimony of the will.

What is required is bold and fast action while national and international opinion is favourable. The spin-off benefits of the nuclear option are also enormous, and the process of its implementation will help development of various other technologies and create direct and indirect employment due to a wide range of local commercial and economic activities. The displaced persons of Rooppur are eagerly awaiting the result of their voluntary and willing sacrifice since 1964.

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Policy -- or "foreign" policy?

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WITHIN days of celebrating the sixtieth anniversary of Pakistan's emergence as an independent country, Pakistanis have been repeatedly reminded of the limitations of their independence.

The pursuit of grandiose strategy by politicised generals at the expense of internal strength has so compromised Pakistan that many of its key decisions are taken only after the intervention of foreign actors.

Every now and then, Pakistan's foreign office warns foreign powers to desist from interfering in Pakistan's internal affairs. But under General Pervez Musharraf's rule, the tendency to look towards outsiders in settling essentially domestic political issues has expanded to a point where nothing seems to be a purely internal affair of Pakistan any more.

Musharraf allowed former Prime Minister Nawaz Sharif to go into exile only after a vague agreement guaranteed by an unnamed international personality. It did not matter to the general that barring a citizen of Pakistan from returning home under an agreement with a foreign national lacked any legal basis, a fact now attested to by Pakistan's Supreme Court.

There is something clearly wrong with the thinking of Pakistan's military-intelligence complex that finds it easier to negotiate about domestic policy through rich foreign potentates without being willing to adopt a policy of reconciliation with Pakistanis for the sake of Pakistan.

In the aftermath of 9/11, Musharraf turned around Pakistan's mistaken policy of supporting Afghanistan's Taliban after a "Are you with us or against us?" admonition from the United States.

For several years before the fateful 2001 terrorist attack on New York's World Trade Centre, quite a few patriotic Pakistanis had warned about the dangers of Talibanisation, only to be condemned as alarmists or traitors by Pakistan's establishment.

Musharraf woke up to the peril of religious extremism only when US officials threatened his regime with dire consequences, in addition to promising billions of dollars in aid.

Pakistan was recently saved from the imposition of a state of emergency after a midnight phone call from US Secretary of State Condoleezza Rice.

Although opposition to imposition of emergency has been widespread within Pakistan, the opinion at home quite clearly does not carry the same weight as the same advice coming from senior American officials.

General Musharraf's off and on negotiations with Mohtarma Benazir Bhutto, the leader of Pakistan's largest national political party, are also said to have materialized only after encouragement from Britain and the United States.

Ms Bhutto has been out of power for a decade, and in exile for most of those years. Her husband, Asif Ali Zardari, spent eight and a half years in prison without a conviction on charges, several of which do not even qualify for such long imprisonment under law.

One cannot fault Ms Bhutto for mobilizing international support to seek a way out of an impasse that has forced her to live in exile, with the sword of legal proceedings dangling without end.

Although many liberal Pakistanis have criticized Ms Bhutto for negotiating with a military dictator, and some have accused her of doing so only in self-interest, her stance makes sense.

Ms. Bhutto continues to refuse to accept General Musharraf's right to rule in uniform, and appears willing only to work out a settlement that reverts Pakistan to democracy.

Transition to democracy in an orderly manner requires some personal concessions to General Musharraf, who would lead Pakistan into a deeper political quagmire if he sees the immediate future as the end of the road for himself.

But even at this stage of widespread unpopularity and lack of domestic legitimacy, Musharraf does not seem to be negotiating with the opposition in good faith.

Not only has the regime's negotiating position with Ms Bhutto changed several times, settled issues have been regularly reopened and promises not kept.

Once again, the general seems to be trying to buy time, and to confuse and divide his opponents. Instead of treating his critics as enemies, Musharraf should look upon them as Pakistanis deserving of respect in view of their popular support.

Their claims to monopoly over patriotism notwithstanding, each one of Pakistan's military dictators has shown greater willingness to listen to foreign voices of influence than to heed the opinions of Pakistan's own thinkers or politicians.

Pakistan's internal issues can be best resolved through national discourse that takes into account international opinion but does not let external players lead the way. The Pakistani establishment's willingness to negotiate with foreigners while refusing to compromise with the country's own leaders diminishes Pakistan's sovereignty.

Pakistan's establishment needs to rethink its inability to maintain dialogue with the country's key political actors while allowing foreigners to negotiate domestic political issues.

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On learning lessons

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WHETHER we are students, teachers, or business people, or in charge of government, learning should never end. Learning is for everyone except for those who are fool enough to think that they have no need for learning.

Do not underestimate the role of fools in a society, or the capacity of ordinary people for foolishness. Intelligent people, too, are capable of doing foolish things. The late professor Alatas, a noted sociologist, once suggested that there should be a sociology of fools alongside sociology of intellectuals.

I think it is not fools but foolishness that needs to be studied. Learning can be one of the checks against foolish action.

Those of us in the business of teaching have a greater need for learning. If we do not learn how can we help students learn? Once upon a time we were teachers and students were learners. Those were the bad old days. Now, under the new philosophy of pedagogy, both students and teachers are partners in learning.

You can learn from anyone, provided you want to. There are few ground rules. First rule -- never put yourself in a position that you need not learn from others. Second rule -- prepare to learn from unusual and unexpected sources. And the third rule -- if you have the humility of mind you will learn.

Reading is a proven source of learning, but listening too is a good short-cut. To be a good listener you have to be a good conversationalist. Reflection on your own actions and behaviour, or events, will also help learning.

The other day, the US President Bush evoked Vietnam to justify his Iraq policy. But he took the wrong lessons. Bush's point was that US should not have withdrawn from Vietnam, a position that historians would find absurd.

The true lesson of Vietnam was to avoid unnecessary military intervention and not to be blinded by ideological blinders. Today Bush will get away with these remarks not because he is right but he still holds power. But history will judge him differently.

I learn a great deal from taxi-drivers wherever I go. Taxi-drivers in Abu Dhabi, mostly from Pakistan, listen to the Urdu programs of BBC and Voice of America dutifully, so a discussion of Pakistani politics with them is always rewarding.

In last one year, I have seen a steep decline of the popularity of President Pervez Musharraf among them. Singapore cabbies are a great source of knowledge ranging from local political economy to international politics. They are sometimes critical of Singapore's founding leader, Lee Kuan Yew.

This is ironical, because Lee's pragmatic policy of 24 hours BBC world service on tap, along with his emphasis on education are some of the reasons why Singapore cabbies are so learned.

Recently, in the wee hour of 1-30 AM, I had a discussion on democracy with a cabbie in New York city. The West Indian cabbie educated me on democracy in Barbados. He said confidently that Barbados had the best democracy in the world.

His knowledge of Bangladesh, however, was confined to the floods; coincidentally, the Caribbean too was bracing for Hurricane Dean. He was not aware that Bangladesh has been flirting with democracy since her independence. We agreed on the need for tolerance and truth as requirements for democracy.

The political developments of the last couple of years in Bangladesh provide ample opportunities for learning lessons. The recent unfortunate incidents following the trifling incident of the Dhaka University led to further escalation, which, according to the chief adviser, was fuelled by miscreants.

The attacks on the students on and off campus, and the arrest of University teachers marked a low point. Remember the police brutality on Mr. Saber Hossain Chowdhury, an opposition MP and the political secretary of the then leader of the opposition, on September 6, 2006, by more than 12 policemen who beat him to unconsciousness, or the beating of Mr. Asaduzzaman Noor, an opposition MP on September 12, 2006. When can we see investigations of these cases?

Use of excessive force is symptomatic of the problem of governance. This is a flagrant violation of human rights. Little reflection seems to have taken place in this regard.

There are many examples when people in position of power fail to learn simple lessons, such as the importance of the rule of law and the value of human rights. As rampant corruption has been one facet of the violation of the rule of law, the other facet remains the behaviour of the elements of the law enforcing agencies.

In the final analysis, the imperative for good governance is rule of law, and the main objective of governance is to protect human wellbeing by respecting their basic human rights. Not too long ago, law enforcers broke the law, resorted to torture and extra-judicial killing, and lied through their teeth. The government must reverse such behaviour.

On August 21, 2004, a grenade attack on Sheikh Hasina's meeting killed 22 people including Awami League leader Mrs. Ivy Rahman. Three years later, Sheikh Hasina, the target of that heinous attack, is in jail. How many suspects of that crime are in custody?

Trust is the basis of good governance, that is the lesson to be learned.

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