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Don't switch over to nuclear power

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The general assumption underlying the nuclear deal signed by US President Bush and our Prime Minister Ma seems to be that nuclear power will be an important component of India's energy future. This is not a new idea, or elsewhere.

Nuclear energy advocates have always offered extravagant growth potential, none of which have materialised. huge budgets and unstinted government support. There are good reasons not to believe them again.

Ever since its inception, the Department of Atomic Energy (DAE) has made numerous confident predictions power in India. Going by those, we should have had 43,500 mw of nuclear power by 2000. Instead we had a m Attributing this to international sanctions following the 1974 nuclear test is a dubious excuse, especially gi rhetoric of indigenous development.

Currently, nuclear power contributes only 3,310 mw, barely 3% of the total generation capacity. Prior to the re DAE's medium term plans called for installing 20,000 mw by 2020, which would constitute only 8-10% of the electrical generation capacity. Nuclear power, even going by the DAE ambitious projections, cannot be consider source of electricity.

The DAE asserts that not only that nuclear power would form an important component of the electricity supply, b be cheap. Even this claim does not stand up to analysis.

A comparison of the costs of generating electricity at the Kaiga reactors and the Raichur Thermal Power Stat plants of similar size and vintage — using the standard discounted cash flow methodology showed that nuclear p competitive only with unrealistic assumptions; for a wide range of realistic parameters, it is significantly more exp

The reason is simple: nuclear reactors cost a lot to build, substantially more than coal or gas based power pl been made worse by the DAE — practically all the nuclear reactors they constructed have had significant overruns.

However, even if one assumes that the future will be different and reactors come up on schedule, the price persist.

This is true elsewhere too. The 2003 Massachusetts Institute of Technology study on the future of nuclear powe an expansion of nuclear power but admits that nuclear power is today "not an economically competitive choice".

The only way the study sees nuclear power growing is if the government offered various subsidies and i favourable policies.

One reason why construction costs cannot be reduced beyond a certain point is safety: nuclear power al electricity generating technologies comes with the possibility of catastrophic accidents, such as the explosion at reactor 20 years ago.

While reactor safety has improved since Chernobyl, the fundamental characteristics that make them prone t highly interactive complex systems with parts that are tightly coupled — remain unchanged.

These characteristics make it hard to foresee all possible accident modes and plan accordingly. Further, sm events quickly spin out of control. Therefore with nuclear reactors, major accidents simply cannot be ruled out.

Practically all the nuclear reactors operated by the DAE have had accidents of varying severity, as have associated with the nuclear fuel chain. Many of these could potentially escalate into a major accident, as Chernobyl. The impact would be disastrous, especially in a country like India with a large agricultural sector.

In the US, private companies considering the construction of nuclear reactors were concerned that such an act would likely bankrupt them and tried to get insurance coverage. No insurance company was willing to take on the risk of liability against such a huge liability; nor could they commit to pay beyond their own resources.

The US Congress had to introduce the Price-Anderson Act that allowed the government to act as the ultimate insurer, in essence a subsidy to the nuclear industry. Such subsidies are not included in the quoted economic costs of nuclear power.

Fast breeder reactors, which have figured prominently in the recent debate, pose even greater safety concerns and are more uneconomical. Unlike the more common thermal reactors, breeder reactors, depending on the design details, can explode, though with a yield much smaller than that of a nuclear weapon.

And because they use plutonium based fuel, which is about 30,000 times more radioactive than uranium-235, the public health impacts of a full-scale accident are worse.

Breeder reactors use liquid sodium to remove the heat generated. Since sodium is opaque, burns on contact and reacts violently with water, breeders are susceptible to serious fires and long shutdowns. These properties make breeder reactors costly to build and maintain.

The use of plutonium as fuel also means that expensive safety precautions are required during fuel fabrication. The fabrication cost for plutonium based fuel is many times the total cost of uranium fuel.

Producing the plutonium through reprocessing spent fuel is also expensive — we estimate that each kilogram could cost about Rs 6.7 million. The PFBR needs about 1,900 kg of plutonium just to become operational and about 100 kg each year to keep it running.

All of these factors make electricity from breeder reactors uneconomical. No wonder many countries, especially those that have privatised their electricity generation such as the UK, have abandoned breeder programmes.

The DAE argues that we need breeder reactors because our uranium resources are limited and because of the large deposits of thorium. But this conclusion is mistaken.

Availability of a resource does not mean that it would be economically prudent to utilise it. If that were to make our electricity come from, say, solar photovoltaic cells. But that would be extremely expensive and uneconomical in the present time.

Similarly the thorium cycle will be uneconomical. Nuclear power is an expensive, risky and unsustainable way to produce electricity. The deal with the US does not change this.

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