Jaitapur nuclear project in India: The next Fukushima?

The French nuclear industry, supported by a group of European commercial banks[1], is lining up to build two European Pressurised Reactors (EPRs) in India. Jaitapur in Maharastra state, the only part of the whole Indian coast officially classed as a 'high risk' earthquake zone[2], has been chosen as the site.

The project has a planned second phase that would add four more reactors, becoming the largest nuclear power plant in the world.

Despite the EPR being celebrated by the nuclear industry as the safest reactor in the world, the only EPRs under construction reveal serious problems. The reactor design itself also has several alarming parallels to Fukushima nuclear power plant that continues to be a major disaster following the earthquake and subsequent tsunami of 11 March, 2011.

Not only is Jaitapur to be built on the coastline, in a high-risk earthquake area, but it is using the similar light water reactor technology that vitally depends on active cooling for weeks even after the reactor is stopped. Its design has apparent weaknesses that make it vulnerable to the same problems that caused the Fukushima accident. And, as proposed, the project would be a whole fleet of very large reactors that could lead to multiple failures and radiation releases.

Nuclear energy is not only the most controversial and hazardous form of energy generation, it is also one of the most expensive. To raise the many billions of euros needed to build even a single nuclear reactor, utility companies rely heavily on banks and other financial market players.

If the deal goes ahead, India will be left with spiralling costs and an energy option that won't meet its energy needs. It will seriously increase nuclear hazards, including contaminating the environment and the danger of deadly nuclear waste that has no safe solution.

The nuclear industry has spent the past decade trying to convince the public and decision makers that, despite its downsides, it will help tackle the climate crisis. But what it offers in reality is an industry that delivers too little, too late, is too expensive and – as we see in Japan these days – is too vulnerable and too dangerous.

1 In October 2009 NPCIL announced it was in talks with a group of French banks on a loan of $3.2 bn US dollars. The group consists of: BNP Paribas France; Calyon, part of Crédit Agricole France; HSBC Bank United Kingdom; Natixis France; and Société Générale France. Hindu Business Line, "Jaitapur nuclear plant will cost Rs 1-lakh cr", Hindu Business Line, 15 October 2009.

2 Geologic Survey of India, letter, 5 January, 2009, http://rahat.up.nic.in/images/seismic.jpg

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The EPR – Dangerously flawed

The Jaitapur project comprises two 1,650 MW nuclear reactors (with the possibility of increasing it with an additional four reactors, which would make it the world's largest nuclear power plant with combined installed capacity of 9,900MW [3]). The Generation III class EPR has been designed and developed by the French company AREVA, which is notorious for its poor track record on quality control - as seen from the EPRs being built in France (Flamanville 3) and Finland (Olkiluoto 3), which are suffering safety problems, construction delays and skyrocketing costs[4].

These projects are riddled with a range of problems, including such fundamental design fault hazards as having the operating system joined with the safety system, meaning that, in an emergency, if the operating system malfunctions it can take the safety system with it. It is also questionable whether they could withstand having an aircraft crash into them.

As the disaster in Fukushima revealed, a major accident with impacts comparable to Chernobyl can also happen at western reactors of different design. The EPR uses light water reactor technology that, similarly to Fukushima, needs active cooling even long after the reactor is stopped to avoid meltdown and major releases of radiation.

It also has some design weaknesses that make it vulnerable to similar accident scenarios, such as the location of back-up diesel generators that provide the vital power supply for cooling close to the ground, making them susceptible to flooding; risk of hydrogen explosion from melted fuel; the location of the control room too close to the reactor, making it inaccessible in the case of serious radiation leakage; or spent fuel ponds being located outside the containment area making them vulnerable to damage and a potential additional source of major radiation release directly into the environment.

Apart from blueprint weaknesses, the actual construction has been very problematic. The Finnish safety agency STUK recorded over 3,000 safety and quality problems with the construction[5] of Olkiluoto 3, stating these problems occurred for a number of reasons, including attempts to reduce costs leading the company to select cheap, incompetent subcontractors and overlook safety-related problems[6]. In France, there are similar problems[7].

In addition, EPR reactors are inherently harder to build and control because of their complexity, larger size and the fact that they are designed to use high fuel burn-up, which places higher requirements and stricter standards on the quality of their construction. In contrast, most Indian reactors built to date have been units up to eight times smaller (220 MW), with just two coming close to even one-third (540 MW) of the size of an EPR (1,650 MW).

India has a total of 20 operating reactors: 18 of 220 MW or smaller, and only two 540 MW reactors. It has a long record of safety and technical problems; one of the most extreme examples is the collapse of a reactor containment, which is designed to protect the reactor, in Kaiga[8].

Hardly any nuclear power station has been built on time, and despite AREVA's promises in Europe - and now India - to date it has failed to deliver on schedule, leaving its projects years behind schedule and billions of euros over budget.

Earthquake hazards

The proposed site for the reactors, and the realities of nuclear waste, pose serious dangers for the local community.

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3 http://netindian.in/news/2010/11/28/0008841/jaitapur-nuclear-power-project-maharashtra-gets-environmental-clearance

4 http://www.greenpeace.org/international/en/publications/reports/epr-the-french-reactor/

5 http://www.spiegel.de/international/europe/0,1518,655409,00.html

6 Management of safety requirements in subcontracting during the Olkiluoto 3 nuclear power plant construction phase, Investigation report 1/06, STUK (Finland's Radiation and Nuclear Safety Authority), 10 July 2006

7 Management of safety requirements in subcontracting during the Olkiluoto 3 nuclear power plant construction phase, Investigation report 1/06, STUK (Finland's Radiation and Nuclear Safety Authority), 10 July 2006; ASN letter from Flamanville-3 inspection, dated 25 January, 2008

8 http://princeton.academia.edu/MVRamana/Papers/264401/Safety_First_Kaiga_and_Other_Nuclear_Stories

Jaitapur is in the only high-earthquake-risk zones on India's coast. The area is classed as being in Zone IV, meaning it is prone to strong earthquakes with the possibility of one reaching 7 points on the Richter scale, which can cause buildings to collapse.

Over the past 20 years alone, there have been three earthquakes in Jaitapur exceeding 5 points on the Richter scale. In 1993, the region experienced one reaching 6.3, leaving 9,000 people dead.[9] And last year, an earthquake caused the bridge to Jaitapur town to collapse. None of this was taken into account when the site was chosen.

Japan was given as an example of a country that managed to build reactors safely on earthquake prone locations. However, as the ongoing Fukushima disaster shows, even with the best technology and most experience in dealing with natural disasters, Japan was not ready to cope with a major earthquake and tsunami that hit a number of reactors built on coastline.

Although the reactors safely stopped at the quake, their cooling system failed to work, which lead to serious damage to several reactors as well as spent fuel stored in the ponds. A series of hydrogen explosions caused multiple major releases of radiation that so far amount to some 20% of release from Chernobyl accident. Despite that most of the contamination was driven to the sea with prevailing winds, there are towns up to 100km away that are contaminated to alarmingly high levels and require long-term evacuation. The economic impacts are yet to be seen, but the damages to the local economy, farmers and fisheries are already estimated to the order of a hundred billion dollars over the next two years.

Nuclear waste – no solution

AREVA claims that one of the EPR's advantages is that it will produce less waste than other reactors. But while the promise is that the volume of waste will be reduced by 15%, the waste it produces will be disproportionately more dangerous because it will contain more readily released radioactive substances.

With regard to radioactivity, the EPR will not be a step forward: improved fuel combustion rates simply lead to more dangerous waste. In addition, by being able to function with 100% MOX fuel (a mixture of uranium and plutonium oxides) the EPR will be a major link in the nuclear reprocessing scheme that is highly contaminating.

Furthermore, there is still no permanent or safe solution for storing hazardous nuclear waste, which remains lethal for millennia. For Jaitapur, there is no plan or fund for long-term waste management. Hazardous, nuclear waste will be an additional burden – both financially and with regard to safety - for the Indian people.

Weak regulation

India lacks an independent nuclear safety regulator. The current Atomic Energy Regulatory Board has members with potential conflicts of interests, and it reports directly to the Department of Atomic Energy that is not only promoting nuclear power, but is also the owner of the NPCIL utility that wants to build and operate Jaitapur.

Relenting to pressure by thousands of people and many experts, the government finally admitted that the regulator in India is not independent and thus a threat to the safety of the reactors. The government of India, after a high-level meeting on 26 April 2011, announced that:

> *"The government will introduce a Bill in the next session of Parliament to create an independent and autonomous Nuclear Regulatory Authority of India that will subsume the existing Atomic Energy Regulatory Board (AERB)."*[10]

However, the government still continues in the approvals and preparation to build Jaitapur reactors.

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9 Jain, S.K. et al 1994: The M6.4 Killari, Maharashtra Earthquake in Central India. EERI Newsletter, Vol. 28, No. 1. http://www.nicee.org/eqe-iitk/uploads/EQR_Killari.pdf

10 http://pmindia.nic.in/lprel.asp?id=1250

Costs

The two Jaitapur EPR units are officially estimated to cost 32,000 crore (€5.4 bn). This is less than half of the cost estimates of building the reactors in Europe or Canada.

Combined with weaker regulation, the pressure to keep costs low in India could cause even larger problems with cutting safety corners and poor quality of construction than we have seen in France and Finland, which are two and four years behind schedule respectively, with cost overruns close to €3 bn euros each. India's nuclear power programme has a history of similarly massive cost overruns, with reactors costing on average three times as much to build than originally estimated.

The argument about cheap labour in India cannot explain such a massive price discrepancy, as most of the price comes from engineering equipment and heavy components, and AREVA has already done its best to outsource work to low-cost countries and suppliers.

India has huge potential for energy, including from wind power, solar collectors, biomass/biogas and geothermal energy. With pressure to reduce global greenhouse gas emissions significantly by 2020 and help tackle climate change, these options are more affordable and safer[11]. They are also faster to build, providing energy in just one to two years from the planning stage, rather than waiting decades, as is the case with nuclear, as costs spiral.

Environmental and human cost

BBC, 27 April 2011: Praveen Gavhankar, a farmer and fruit transporter, said he and thousands of villagers in western Maharashtra, had become totally frustrated over the government's determination to allow the construction of six large reactors at Jaitapur, in an active earthquake zone.

"And so," said Mr. Gavhankar, "the people have decided that, rather than letting a Fukushima happen in Jaitapur 15 years later, it's better to die today and stop the plant."

The site is on productive, agricultural land, which will deprive some 1,000 families of their farming land and 6,000 people who depend on fisheries will also be affected. Between December 2009 and January 2010, Nuclear Power Corporation of India officials seized 938 hectares of land from local villagers, offering as little as 3 INR (5 euro cents) per square metre, which villagers unanimously rejected.

An impact assessment by the extremely reputable 'Tata Institute of Social Sciences' came to the conclusion that the Jaitapur Nuclear Project will have a "huge negative impact on social and environmental development". Studies by the Bombay Natural History Society show that the project will also cause extensive environmental damage, for example to threatened mangrove ecosystems on which local fisher folk depend.

The environmental licensing process for Jaitapur has violated both Indian law and the Equator Principles by denying affected communities access to the Environmental Impact Assessment Report and beginning forced acquisition of land without prior community hearings.

Accordingly, the project has already led to massive social conflicts as over 1,000 families will lose their farms and many more will lose their fishing grounds. In the past months, the local opposition to the project - which has been peacefully protesting against the project for the last four years - has grown massively and now includes numerous academics, unions, social justice and environmental groups, political parties, workers' associations and former government, High Court judges and military officials.

As recently as April 2011, one person has been killed by the police and more than 1,500 people have been detained during protests against Jaitapur. Human rights activists, including the former High Court judge B.G. Kolse-Patil, have criticised the government for using violence and false criminal charges against peaceful protestors.

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[11] http://www.greenpeace.org/international/en/publications/reports/Energy-Revolution-A-Sustainable-World-Energy-Outlook/

Why India should not embark on nuclear expansion

Most decision makers and investors talk about sustainability and corporate social responsibility, yet the entire nuclear cycle blatantly contradicts this. Radioactive contamination routinely occurs throughout the fuel chain, from uranium mining to processing, reactor operation to the management of nuclear waste.

A severe accident of a typical pressurised water nuclear reactor, due to technical or human failure, could affect many millions of people, causing tens of thousands of victims and forcing the evacuation of areas as large as Belgium.

The nuclear industry has spent the past decade trying to convince the public and decision makers that, despite its downsides, nuclear power is needed to tackle the climate crisis. The industry promised to have learned from past disasters, and that it would offer a clean, safe, cheap and reliable source of energy. None of these claims is true.

The 2010 International Energy Agency (IEA) energy scenario clearly shows that, even if the world were to build 1,300 new reactors and quadruple nuclear power generation by 2050, greenhouse gas emissions would be reduced by less than 4%. Given the long planning and construction schedules required, this would come far too late to meet the imperative to significantly decline greenhouse gas emissions by 2020 and thus prevent climate chaos.

In addition, implementing the IEA scenario would require $10 trillion US dollars for reactor construction, massively increase the amount of nuclear waste that we and future generations will have to deal with, and create enormous proliferation hazards. A single reactor typically produces several hundred kilograms of plutonium every year – an amount sufficient for dozens of nuclear of nuclear weapons.

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