THE FAULTLINES AT JAITAPUR AND THE GEOLOGICAL SURPRISES OF THE NEW CENTURY

The unresolved safety issues of the world's biggest nuclear park in India housing 6 Areva reactors

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While the ongoing Gorkha earthquake which came in being in April 2015 is still shaking the Himalyas and the Indo-Gangetic belt, the Department of Atomic Energy (DAE) and the public sector undertaking – the Nuclear Powr Corporation of India Ltd (NPCIL) have been placed in an awkward situation as they have no credible explanation for selecting a high seismic risk coastal zone for the biggest nuclear power park in the world which will house six French Areva reactors with a total installed capacity of 10,000 MW(e). Besides the other common issues of cancer and genetic diseases, impact on the farms and fisheries, possibility of an earthquake is the immediate concern of the people in Ratnagiri, Mumbai and other Western Ghat states. The recent

Even before the Fukushima disaster, the seismicity of the area was a major talking point. While Jaitapur district is seismic zone -IV, NPCIL decided to make it in zone -III and asked its EIA contractor to do the paper work. According to Pradeep Indulkar, "the Environmental Impact Assessment (EIA) prepared by NEERI does not address the true seismicity of the region by claiming it to be zone 3 as opposed to being zone 4. To build a nuclear plant in a seismic zone 4 would be disastrous not just for the people living in the vicinity of the nuclear plant but also for the country. It would be a disaster waiting to happen".

People also came to know that the present site was considered for a smaller campus of two reactors of 200 or 220 MW(e) in 1971 and2002. Reports of the Chathurvedi committee and Chatterjee committee which cautioned about the earthquake risk were treated as confidential by the NPCIL. Parts of these reports were released in response to the orders of the Information Commissioner. Excerpts from the committee reports:

> “Vijaydurg-Hamdara' lineament cutting cross Madban pltaeu runs along the coast on either side of Jaitapur. . It has a trend of NNW-SSE, a most dangerous

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geological feature as far as seismic activity is concerned. Also Vijaydurg and Hamdara-Padve lineaments run within 5 kms of Madban plataeu. Earthquakes can occur at any time in this region along these faultlines." (Chathurvedi committee)

"Tectonic features in the region such as faults etc can be regarded as potential sources of earthquakes as some of them may possibly get reactivated at any un known point of time. These can get activated by either local adjustments in the earth's mass or by a seismic disturbance in the region." (MN Chakravarti 1972)

According to MK Prabhu, "Madban platau is surrounded by faultlines that run 50 to 100 km. They have NNW-SSE trend which is the same as wsestcoast fault or Malabar fault trend. It is a trough fault with a down throw of 2000 m. A series of trough faults occur within this trough. A series of satellite faults like Koyna, Latur, Warna, Chiplun, Rajapur and Vijaydurg resulted along with this fault. Due to these faults, Madban and Rajapur region is very unstable geologically".

Roger Bilham, eminent geo-physicists says that "since Jaitapur lies in the same compressional stress regime that has been responsible for generating both the Mw=6.3 Latur and the Mw=6.4 Koyna earthquakes in the past five decades it can be argued that a *similar sized event could possibly occur directly beneath the power plant*. It is not possible to confidently say that an earthquake of a high magnitude would not occur in Jaitpur as one needs to examine reliable data spanning many centuries in order to do so. With regard to Jaitapur, the available data that can be relied upon only extends to last 200 years – a small time in geological history".[1]

While the IAEA safety guideline mandates an examination the seismic history of a proposed nuclear ssite for at least 10,000 years, NPCIL opted to get data for one year and contracted the National Geo-physics Research Institute (NGRI) "to monitor the seismicity within 50km radius from Jaitapur. From April 1, 2005 to March 31, 2006, five seismic stations were operated at Madban, Karepatan, Dassur, Mutat and Mervi. It was noticed that no earthquake has been recorded within 50km from Jaitapur during the above period."[2]

While Chathurvedi, Chakravorty and Prabhu are talking about the knowns – the faults and

lineamens that are visible and have been mapped, Prof Vinod Gaur is concerned about the unknowns. “India’s western coast, a well-recognised zone of potential seismic vulnerabilities, is likely laced with ancient faultlines buried under sediments and waiting to spring back like a piano accordion under continental compression. It is intriguing that Jaitapur, the chosen site for the world’s biggest nuclear power plant, should have been declared seismically safe without refuting these possibilities. My concern is that the various geological proxies of faultlines around Jaitapur and their possible implications on the plant and public safety have been neither adequately studied nor communicated.”[3]

Geological Surprises of the Modern Times

While the atomic energy establishment is bent upon denying any seismic risk and trying to control and manipulate the flow of information, the Gaia is springing up new surprises, forcing the earth science community to modify many of their theories and expectations. We will look at two such instances here.

1. The Surprise from the Himalayas.

Vinod Gaur and Roger Bilham are foremost among the scientists who have been studying the siesmicity of the “collision zone” along the Himalayan arc, where the Indian plate crushes continuously into the belly of the Tibetan plate at 20 mm a year. A decade ago, in a paper published in the journal Science, they predicted “a great Himalayan earthquake that could put millions of people at risk in the towns and villages of the Gangetic plains”.

Is the ongoing Gorkha Earthquake swarm which began in April 2015, the one predicted by Gaur and Bilham? A report by Erik Hand and Priyanka Pulla published in Science reveals that it is not. “Geophysicists studying the rupture mechanics of the magnitude-7.8 earthquake in Nepal have made a startling discovery:

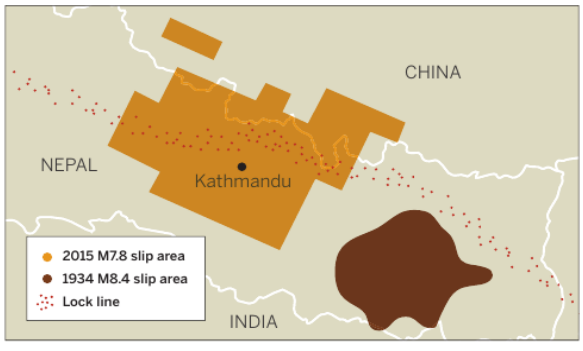


Plate 1. The Lockline and 1934 & 2015 events.
The small red dots make up the lock line. Nearly half the ruptured area of the Gorkha Earthquake is to the North of the lockline)
Courtesy: Sciencemag, ref (4)

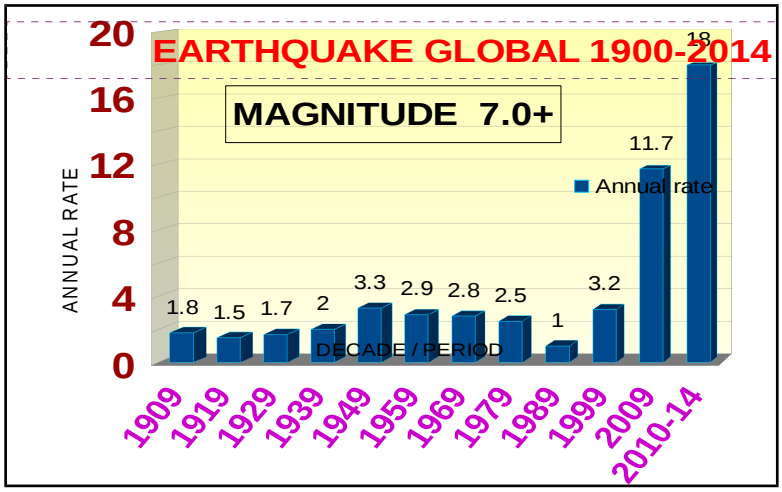
> “that the quake extended deep into the Himalayas, into a region that many scientists had deemed incapable of explosive tearing. The rupture extended past a "lock line" where

brittle rock becomes more plastic in its behavior—a region where slip was expected to creep along quietly and not contribute to the overall power of the earthquake. The discovery suggests that, as awful as the present disaster is, future earthquakes in the Himalayas could end up being mightier and more calamitous than modelers assumed. ...A still more brutal blow could be coming. Although the Nepal quake released some of the seismic energy in the locked plates, more strain west of the 25 April epicenter must be released . But with an even greater threat looming, Nepal and its neighbors will have to take a hard look at their earthquake preparedness."[4]

Normally, after a great earthquake, everybody is relieved because the expectation is that the next one will happen centuries or millennia later. In this case, the caption of the report - 'Nepal disaster presages a coming megaquake' -is unsettling.

The Second Surprise -Increase in Earthquakes since the middle of 20th century

There are reports of a significant increase in global seismicity since the middle of the last century. Part of this increase is attributed to human actions. Some of the human acts that have been recognised as the causes of earthquakes are (a) underground nuclear weapon tests, (b) mining and tunnelling (c) fracking and disposal of waste water and (d) impounding water in reservoirs. All the reported 'anthropogenic quakes are of magnitude lower than 6.0.



We have analyzed the earthquakes of magnitude >6.9 from 1900 to 2014. The data for the period 1900-2012 is from the United States Geological Service (USGS) and for 2013-14 is from European-Mediteranian Siesmology Centre (EMSC).[5,6] During the first half of the last century, there were very few earthquake monitoring instruments. However, the lack of instruments is not likely to miss earthquakes of magnitude 7 and higher.

During the first decade, there were 18 events worldwide (1.8 per year). There was a significant increase from the fifth decade onwards, but throughout the last century the rate remained less than 4 per year. The increase during the period 2000-2009 and 2010-2014 is obvious.

The official denial of enhanced global seismicity

In a paper published in the Proceedings of the National Academy of Sciences (PNAS) Shearera and Stark argue that there is no real increase in the rate of earthquakes. The authors used the data of earthquakes of magnitude 8 and above, which are far fewer in number. They also subjected the data to a technique called de-clustering. In this process, all earthquakes occurring within three years and 1000 kms of the largest event are treated as foreshocks or aftershocks of the biggest event and counted as one. "For example, we remove both the March 2005 *M* 8.6 and September 2007 *M* 8.5 Sumatra earthquakes, retaining only the December 2004 *M* 9.0 Sumatra-Andaman earthquake. Declustering in this manner removes many events that might not traditionally be classified as aftershocks."[7] We are discussing about the potential threat to dangerous installations like nuclear power parks from earthquakes. For this discussion, 10 hits are 10 hits, whether all the hitmen come from the same or different families.

The DAE and NPCIL do not behave like science-driven organizations. The hiding of earlier studies on the Jaitapur site by Chakravorty and Chathurvedi proves that they are aware of the risks. If an accident occurs at the park, the first victims will be the scientists, engineers, technicians and workers of DAE and NPCIL. All the reactors involved in major accident from Three Mile Island to Fukushima have been abandoned. Abandoning the Jaitapur park will ultimately bankrupt the NPCIL. DAE-NPCIL is neither concerned about the health and well being of their employees and families nor about the financial health of the company. This is mainly because the huge resources under their command is public property and these organizations are not accountable to any one.

The toxic burdern of Jaitapur

What will be the toxic burden of Jaitapur, if the project takes off and the park is fully commissioned? All the six reactor pressure vessels inside the nuclear islands will have 1000 tons of radioactive fuel on day one. The fissile isotopes (uranium 235) wll be about 35 to 40 tons, equivalent to about 400 Hiroshima bombs. Each year, about 200 tons of spent fuel containing plutonium, cesium. strontium and uranium will be removed from the pressure vessel and kept in swimming pools inside the double containment. That is equal to 100 Nagasaki bombs. The total radioactive inventory at JNPP will be 1200 tons at the end of the first year of operation, 6000 tons at the end of the fifth year and 12000 tons at the end of the tenth year. The temples they are going to erect to house these toxins will be lying over those fault lines and lineaments.

DAE's own experts were against setting up two small reactors of 400 MW(e) at Jaitapur, because of the sites earthquake potential. Four decades down the line, their successors have no qualms in

setting up a park which will be 25 times bigger than the original one. Studies by biochemists and psychologists show that men addicted to gambling have higher level of testosterone. Those gamblers are risking their and their children's wealth; hence that can be considered a family issue as the profit or loss will be shared within the family. The modern gamblers who have access to huge public resources and control technocratic empires, are into a different type of gamble, which involves the lives of thousands of children, including their own. Testosterone is a wonderful molecule that ensures continunity of the species, besides the pleasure in the act of reproduction. That molecule at higher doses has dangerous potential, in elderly men, with a criminal brain and no reproductive futures.

The proposed JNPP is also at risk from mega tsunami, the source for which is less than an hour from the site. This will be discussed in our next despatch.

To summarize, the proposal to give away the picturesque land inhabited by a peaceful community, famous for Alphonso, the queen among manoges, in the midst of a highly productive sea and land to the French nuclear vendor – Areva by NPCIL and the approval of the project by the Central Government are indicative of the lack of concerns for the peoples health, ecology and regional economy and callous disregards to the rules of managing public funds. NPCIL which came into being only a few decades appears to be on a suicidal and genocidal mode. We cannot afford to let it happen.

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