

Summary of independent expert analyses of the Rampal Power Plant

Introduction

This is a summary of expert reports commissioned by the National Committee for Saving the Sundarbans (NCSS) in response to a proposal to build the controversial Rampal Power Plant (RPP), a 1,320 megawatt (MW) coal-fired power plant on 742 hectares of land on Bangladesh's Passur river at the edge of the World Heritage listed Sundarbans wetlands.

The RPP is proposed to be built and operated by the Bangladesh-India Friendship Power Company Limited (BIFPCL), a joint venture of the Bangladesh Power Development Board (BPDB) and India's largest power producer, NTPC Limited. BIFPCL proposes to build and operate two adjacent 660 MW plants, originally planned to be operational by 2018. Expected operation of the RPP has now slipped to 2021 and its original capital costs estimate of US\$ 1.8 Billion is very likely to balloon past US\$ 2 Billion.

For four years, NCSS has demanded a comprehensive and accurate environmental impact assessment (EIA) be conducted for the proposed RPP, one that fully assesses the numerous inherent and identified risks it poses to the sensitive environment of the Sundarbans, the health and safety of neighboring communities, and the regional and national social and economic well-being. To date, BIFPCL has failed to deliver an adequate EIA in this regard.

In the absence of a proper EIA, NCSS has enlisted inputs from independent and impartial experts in finance, air pollution control technology, water pollution, sea level rise, subsidence, seismic stability, coal ash ponds and coal dust. The summary findings of all these independent experts unanimously conclude that the proposed RPP:

1. Is a second class power plant with outdated and inadequate technology that is insufficient to prevent unacceptable negative impacts to the Sundarbans and local community health.
2. Has not fully considered flooding and earthquake risk which could lead to contamination of surrounding waterways with toxic heavy metals.
3. Is a financial risk and may place Bangladesh in an economic straightjacket from which it cannot escape.

A second class power plant with outdated and inadequate technology

NCSS commissioned relevant experts to prepare a *Rebuttal of the National Committee for Saving the Sundarbans to the Maitree Power Plant Authority's 10 Point Q&A of July 2016*.

Air pollution

Dr. Ranajit Sahu¹, air pollution control expert and consultant on energy issues, concluded that:

- The proposed RPP is not a state of the art, low air pollution facility.
- The proposed NOx (nitrogen oxides) controls are typical of coal units that are roughly 30 years old. Such a system would never be permitted in developed countries.

¹ https://www.puc.nh.gov/Regulatory/CASEFILE/2011/11-250/TRANSCRIPTS-OFFICIAL%20EXHIBITS-CLERKS%20REPORT/11-250%202014-10-14%20EXH%2019%20ATT_SAHU%20TESTIMONY.PDF

- The proposed controls for sulfur dioxide is not fully explained or substantiated in tender documents or in the EIA.
- The proposed RPP will use inadequate technology for particulate matter (PM) and mercury removal. Mercury from the RPP will accumulate in the aquatic food chain of fish and crustaceans of the Sundarbans. In the United States, required mercury removal technologies are increasing the carbon content of coal ash, making it far less marketable. Dr Sahu speculates as to whether BIFPCL may be loath to add effective mercury control technology at RPP as this would make its generated coal ash less marketable.

Water pollution

Donna Lisenby², coal-fired power plant water pollution expert at Waterkeeper Alliance, concluded that:

- The RPP is not a state of the art, zero water discharge facility.
- Despite being required by coal power plants in India, the RPP will not use recycled or reclaimed water and will instead pump water from the Passur river for coal dust suppression, plant cooling, flue gas scrubber waste removal, and ash disposal.
- The RPP will add water to coal ash, creating a toxic wet coal ash slurry. 422 cubic meters of wet coal ash will be pumped into the plant's ash pond each day.ⁱ The coal ash pond is likely to eventually leak or spill due to earthquake and flood risks, contaminating the Sundarbans with arsenic, cadmium, hexavalent chromium, lead, mercury, thallium, and uranium.ⁱⁱ
- 26 kilometers from the Bay of Bengal to the RPP site must be dredged, removing over 34 million cubic meters of river bottom that provides habitat for fish, crustaceans, and dolphins. Every year of the RPP's operations, maintenance dredging would be required to maintain access, removing 1.8 million cubic meters of river bottom each year.
- The required dredging of the Passur river, and the dumping of dredge spoil in the river and sea, may increase the turbidity of water, reduce fish catches, change fish habitats, migration, feeding, spawning and diversity.ⁱⁱⁱ

Coal dust

Prof. Deb Niemeier³, Professor & Chair at Davis Department of Civil and Environmental Engineering, University of California, USA, concluded that:

- The proposed RPP is not a state of the art, low coal dust facility.
- Roughly between 2.0 to 3.8 tons of fugitive coal dust will escape into the air and water each year at the RPP.^{iv}
- The proposed RPP water-only sprinkler system^v has been shown to be relatively ineffective at controlling dust.^{vi} Coal dust escapes from stockpiles even with more stringent pollution control technologies, including chemical surfactants, which are not required at the RPP.^{vii}
- Dust control wastewater from the RPP, if discharged into the Passur river, could result in significant biological impacts.^{viii} Coal dust that reaches water deposits or washes into water can have adverse physical effects on exposed aquatic organisms including abrasion, smothering, reduction in availability of light and clogging of respiratory and feeding organs.^{ix} Studies have

² <http://waterkeeper.org/staff-member/donna-lisenby/>

³ http://www.davishydro.com/Hydro/Team/Deb/Summer_08_CVFull.pdf

shown that the young of some species of fish exposed to coal dust experienced 100% mortality after only 0.5 to 2.5 hours of exposure^x and are at risk of cancer and mutations,^{xi} reduced growth rates, and reproductive failure.^{xii}

- Coal dust has been documented in soil over 20 kilometers from the nearest coal stockpile, where it contaminated soils with arsenic up to five times higher than background levels,^{xiii} increases soil acidity and heavy metal concentrations, decreases plant diversity,^{xiv} depletes soil nutrients, damages forests and farm crops, affects the diversity of ecosystems,^{xv} and increases acidity and changes nutrient balances in waterways.^{xvi}
- Fine particles of coal dust (PM10 and PM2.5) are directly linked to health problems, including premature death, heart attacks, asthma^{xvii} and health effects including skin damage, circulatory system problems, and increased risk of developing cancer.^{xviii}

Coal ash disposal

Charles H. Norris Ph.D⁴, a professional geologist with over 40 years of professional experience in geology, hydrogeology and management in the applied and theoretical geosciences, concluded that:

- A coal fired power station such as the RPP is inherently a bad idea in the proposed setting as the potential for environmental damage is substantial. Indeed, it would be difficult to identify a location less appropriate for such a facility.
- Despite an acknowledgement in the documents reviewed that the RPP site is seasonally flood prone and only one meter above sea level, there is a gaping lack of quantitative design specifications or characterization of the site in the RPP documents.
- Minimizing environmental contamination requires that fly ash be contained and kept dry but that the proposed RPP ash management consists of either lagooning (adding water as part of its management) or uncontained distribution across very large areas. Coal ash will react with water to form leachate, potentially including cadmium, lead, arsenic, mercury, radium, uranium and other toxic pollutants, and if it is not contained, environmental contamination will occur.
- Contamination will be inevitable as even though the ash will be contained within the dyke, the RPP site is inappropriate as it is minimally above sea level and the area is subject to typhoon-driven storm surges, tsunamis, and seasonal flooding that will become worse due to climate change and rising sea levels.
- While the project materials reviewed acknowledge potential earth quakes up to 7.0 on the Richter scale⁵, a recent study^{xix} projects that seismic events as high as 9.0 may occur in the region. Such seismic activity can directly impact the containment structures and liquefy the sediments of the delta on which the structure is built, indirectly producing containment failure.

⁴ <http://www.geo-hydro.com/norris-pf.htm>

⁵ The Richter scale is a log scale of wave amplitude and a power scale of energy released. Each Richter unit increase represents a 10-fold increase in shake amplitude and a 31.6-fold increase in seismic energy. Thus, a 9-unit earthquake represents the shake amplitude 100 times that of a 7-unit earthquake and 1000 times the energy released.

Storm surge and earthquake risks

- Klaus H. Jacob, Ph.D. Special Research Scientist and Adjunct Professor Lamont-Doherty Earth Observatory Columbia University.⁶

Dr. Jacob undertook a comprehensive analysis of the RPP in respect to available data on global climate change, sea level rise, coastal storms and natural hazards including earthquakes, seiches⁷, land subsidence, and river avulsion⁸ specific to the location of the RPP. His findings include:

- The poorly planned RPP is exposed to very high-risks of coastal storm floods and seasonal river floods, accelerated by climate change and sea level rise. As the current design height of the RPP Coal Ash Pond Dam is 5.6m above Mean Sea Level (MSL), he estimates that with predicted sea level rise due to global warming and under certain weather and tide conditions, a probable storm tide may be generated of up to 7.4m MSL that would inundate the entire RPP by over 2 meters and almost certainly result in the Coal Ash Pond Dams being flooded leading to contamination of the Passur River below the RPP.
- There are under-assessed risks of giant earthquakes, regional and local ground motion amplification and resonances, and river avulsions, which may have serious negative consequences. These risks have either not been taken into account at all, or have only received scant attention in the EIA, initial designs specs, cost-benefit analyses, or for the provision of reliable and sustainable electricity generation.
- In order to make the RPP plant safe at its proposed location and over its lifetime (including decommissioning), it may not be possible for it to produce electricity at a cost affordable to customers. Renewable energy options need to be explored for the site, which could generate up to 360 MW and would pose far less of a risk.

Financial risk

IEEFA, 2016. Risky and over subsidized: A financial analysis of the Rampal Power Plant

The highly respected Institute for Energy Economics and Financial Analysis (IEEFA)⁹ provided a financial analysis of the proposed RPP, concluding that the project has outdated ultra-supercritical technology and is heavily subsidised by the Indian and Bangladeshi governments. There are a number of risks to taxpayers and electricity customers as well as to project backers in India, including the Indian government. IEEFA suspects that the project is being promoted as a means to sell Indian coal to Bangladesh and as a way to skirt Indian policy against building a coal plant so near the Sundarbans.

IEEFA identifies 10 financial flaws of the RPP.

1. The RPP will increase Bangladesh electricity prices by 32% due to the tariff levels needed to recover the revenue requirements of the RPP. Without subsidies the plant's generation costs are 62% higher than the current average cost of electricity production in Bangladesh.

⁶ <http://www.ldeo.columbia.edu/user/jacob>

⁷ A seiche is the sloshing of fluids in a constrained basin. Large earthquakes generate considerable ground motions, especially in the thick sediment-filled Ganges-Brahmaputra Basin, and hence can produce strong seiches, with the potential to damage or destroy embankments, levees, berms, and tanks holding fluids, or any other water or fluid containment structures.

⁸ Avulsion is the rapid abandonment of a river channel and the formation of a new river channel.

⁹ www.ieefa.org.

2. The true cost of the RPP is being hidden by subsidies worth more than US\$3 billion; (1) The Bangladesh government 15-year income tax exemption - US\$936m; (2) A below-market-rate loan by Indian EXIM Bank - US\$988m; and (3) Bangladesh granting of an effective annual US\$26m subsidy by conducting maintenance dredging to assure coal delivery to the plant.
3. Delays will further increase capital cost beyond those previously disclosed, and will place additional upward pressure on tariffs.
4. The RPP faces major community opposition posing a significant threat to the timely completion of the construction and uninterrupted operation of the plant.
5. There is no guarantee that the RPP will achieve the assumed 80%-85% plant load factor. The average plant load factor (PLF) for coal-fired power plants in China dropped below 50% in 2015, and has been below 60% since 2013. In the U.S., the average coal power plant operates at 55% PLF, and in India, the average coal-fired power plant operated at an estimated 58% in 2015-16. There is nothing in the RPP to suggest it will buck these trends, as a result—if built—would be a candidate for stranded-asset status.
6. The RPP reliance on imported coal will expose consumers to global coal market risks. Global coal prices currently are near multi-year lows and are expected to remain low for the foreseeable future, but any major unforeseen increase in global coal prices and/or the exchange rate would have a major impact on required tariffs. It is more than possible that cost of coal use will increase as the world adopts more stringent carbon policies. RPP customers would bear the brunt of such increases.
7. The proposed RPP is in the “Wind Risk Zone” and within the path of storm surges representing a significant financial risk, since the plant would be extremely vulnerable to storm surges and, therefore, to outages and damage.
8. The absence of a clear management plan for accidents and emergencies is of note, posing a risk to plant operations.
9. As the project would constitute a large chunk of India EXIM Bank’s loan book, it would put the EXIM Bank’s international fund-raising capacity at risk, and the coal aspect of the project would create refinance risk.
10. The Bangladesh electricity system is already losing nearly US\$1 Billion per year, an unsustainable situation the RPP will probably only make worse. The Bangladesh government, in the event of the further budget deficits, may no longer fully support electricity-system losses.

IEEFA observed that Bangladesh has one of the most successful distributed solar rooftop programs in the world, already powering 10% of the country’s households, and that the government of Bangladesh is pursuing grid-connected solar power generation of 1.7GW of solar capacity by 2021 and 6GW by 2030. IEEFA suggests that Bangladesh has a potential to generate 380TWh electricity a year through solar photo voltaic (PV) installations and believes that utility solar should be the focus of policy makers. Although land availability in Bangladesh is a constraint, just 0.15% of Bangladesh land would be required, for even an ambitious goal of 10GW of utility solar by 2025.

Rooftop solar can bring electricity immediately to the one-third of Bangladeshis who have no access to the centralized grid, and avoid the massive water usage, pollution, and waste-ash disposal problems of coal thermal power generation. Solar energy:

- does not create air and particulate pollution and the associated health costs,
- allows speed of implementation, taking less than a day rather than a decade to commission;

- can tap into global financial capital flows designated to facilitate emerging-market low-carbon emissions investment;
- has almost zero operational costs once built;
- avoids land acquisition and resettlement issues; and
- can be scaled up rapidly in commercial and industrial sectors.

IEEFA noted that solar programs in Bangladesh would attract expanded financial support from the Asian Development Bank, new debt capital support from the Asian Infrastructure and Infrastructure Bank (AIIB) and/or the New Development (BRICS) Bank and from the rapidly developing global green bond market. It would also likely attract equity capital investments from the World Bank's newly established Climate Investment Fund's Clean Technology Fund, the Green Climate Fund, as well as global electricity corporations like Softbank and SkyPower of Canada.

IEEFA concludes that the proposed RPP is fraught with unacceptable risk, out of step with the times, and would set Bangladesh back and should be cancelled. IEEFA suggests that Bangladesh should leverage on India's experience to quickly bring down cost of grid connected utility scale solar power to be a lower cost solution than imported coal.

Conclusion

The overwhelming conclusion drawn from these experts is that the proposed RPP be cancelled.

Consequently, and based on these expert assessments, NCSS is issuing the following statement:

“We call on our respected Prime Minister to stop government statements of pure propaganda, read the independent analyses of these experts and to stop the sheer economic and environmental folly of the Rampal coal plant. We urge our Prime Minister to listen to the combined democratic voices of experts and the people of Bangladesh and thereby cancel the Rampal coal plant.”

ⁱ Maitree EIA vol. 1 (2013) at page 110, available at:

http://www.bpdb.gov.bd/bpdb/index.php?option=com_content&view=article&id=299 .

ⁱⁱ See IFC guidelines for thermal power plants, Table 5, page 18.

ⁱⁱⁱ EIA pages 271-274.

^{iv} See Dr. Niemeier's formal statement for NCSS with appendix of calculations of coal dust emissions.

^v BIFPCL, *Tender Document, B4- Fuel and Ash Systems* (2015),

<http://www.bpdb.gov.bd/download/bangladeshIndiaFriendship/TenderDocument/FTS%20Section-V/B4-Fuel-and-Ash-Systems-Specification.pdf>.

^{vi} See, e.g., J. McCoy et al., *Evaluation of charged water sprays for dust control*, U.S. Bureau of Mines Pittsburgh (1983), <http://www.cdc.gov/niosh/nioshtic-2/10002927.html> (“Laboratory tests were made showing charged spray is considerably more effective at reducing dust on a unit water basis than hydraulic spray.”).

^{vii} SK Nicol & JB Smitham, *Coal Stockpile Dust Control*, International Coal Engineering Conference (1990), <https://search.informit.com.au/documentSummary;dn=832334232851298;res=IELENG>.

^{viii} Phyllis Fox, Ph.D., PE Consulting Engineer, *Environmental, Health And Safety Impacts Of The Proposed Oakland Bulk And Oversized Terminal* (September 21, 2015), <http://nocoalinoakland.info/wp-content/uploads/2016/02/05-Earthjustice-Exh-B-Phyllis-Fox-Report-9-21-2015.pdf>.

^{ix} Michael J. Ahrens and Donald J. Morrisey, *Biological Effects of Unburnt Coal in the Marine Environment*, *Oceanography and Marine Biology: An Annual Review*, v. 43 (2005), https://www.researchgate.net/publication/236876904_Biological_Effects_of_Unburnt_Coal_in_the_Marine_Environment.

^x C.F. Pautzke, *Studies on the Effect of Coal Washings on Steelhead and Cutthroat Trout*, Transactions of the American Fisheries Society, v. 67 (1937), [http://www.tandfonline.com/doi/abs/10.1577/1548-8659\(1937\)67%5B232%3ASOTEOC%5D2.0.CO%3B2](http://www.tandfonline.com/doi/abs/10.1577/1548-8659(1937)67%5B232%3ASOTEOC%5D2.0.CO%3B2).

^{xi} P.M. Campbell and R.H. Devlin, *Increased CYP1A1 and Ribosomal Protein L5 Gene Expression in a Teleost: The Response of Juvenile Chinook Salmon to Coal Dust Exposure*, Aquatic Toxicology, v. 38 (1997), <http://www.sciencedirect.com/science/article/pii/S0166445X9600848X>.

^{xii} *Id.*

^{xiii} William Bounds and Karen Johannesson, *Arsenic addition to soils from airborne coal dust originating at a major coal shipping terminal*, 185 Water Air and Soil Pollution 1, 195 (2007), available at <http://link.springer.com/content/pdf/10.1007%2Fs11270-007-9442-9>.

^{xiv} Sherry Spencer, *Effects of coal dust on species composition of mosses and lichens in an arid environment*, Journal of Arid Environments, v. 49, issue 4 (2001), <http://www.sciencedirect.com/science/article/pii/S014019630190816X>.

^{xv} Phyllis Fox, Ph.D., PE Consulting Engineer, *Environmental, Health And Safety Impacts Of The Proposed Oakland Bulk And Oversized Terminal* (September 21, 2015), <http://nocoalinoakland.info/wp-content/uploads/2016/02/05-Earthjustice-Exh-B-Phyllis-Fox-Report-9-21-2015.pdf>

^{xvi} *Id.*

^{xvii} Phyllis Fox, Ph.D., PE Consulting Engineer, *Environmental, Health And Safety Impacts Of The Proposed Oakland Bulk And Oversized Terminal* (September 21, 2015), <http://nocoalinoakland.info/wp-content/uploads/2016/02/05-Earthjustice-Exh-B-Phyllis-Fox-Report-9-21-2015.pdf>

^{xviii} *Id.*

^{xix} Michael Steckler, *et al.*, *Locked and loading megathrust linked to active subduction beneath the Indo-Burman Ranges*, Nature Geoscience 9 (August 2016)