Risky and Over-Subsidised: A Financial Analysis of the Rampal Power Plant

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Executive Summary

The Rampal Power Plant is a proposed 1,320-megawatt imported coal-fired power plant promoted 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.

The project is being designed around outdated supercritical technology and is being heavily subsidised by the Indian and Bangladeshi governments. This report highlights a number of risks to taxpayers and electricity customers as well as to project backers in India—not the least of which is the Indian government itself. The Institute for Energy Economics and Financial Analysis (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, a protected forest and World Heritage Site.

This reports describes 10 serious flaws in the Rampal proposal:

1. The Plant Will Lead to Higher Electricity Rates in Bangladesh

The revenue requirements of the Rampal plant would require tariff levels that are 32% higher than the current average cost of electricity production in Bangladesh and will therefore increase electricity rates in Bangladesh. Without subsidies the plant's generation costs are 62% higher than the current average cost of electricity production in Bangladesh.

2. The True Cost of the Plant Is Being Hidden by Three Subsidies Worth More Than US$3 Billion

First, the Bangladesh government is proposing a 15-year income tax exemption for the plant, an exemption worth US$936m. Second, a below-market-rate loan by Indian EXIM Bank represents a US$988m subsidy effectively paid by Indian taxpayers to Bangladeshi consumers. Third, Bangladesh would be granting an effective annual US$26m subsidy by conducting maintenance dredging to assure coal delivery to the plant.

3. Delays Are All But Inevitable, as Are Further Increases in Capital Costs

Coal-fired power plants regularly take the best part of a decade to proceed through planning and construction to full commercial operation. This project is no exception. Further delays and cost increases beyond those previously disclosed are likely, and will raise the capital cost of the plant and place additional upward pressure on tariffs.

4. The Plant Faces Major Community Opposition

Opposition from local residents poses a significant threat to the timely completion of the construction and uninterrupted operation of the plant.

5. There Is No Guarantee That the Plant Will Achieve an 80-85% Plant Load Factor as Assumed

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 Rampal project to suggest it will buck these trends, and the plant, as a result—if built—would be a candidate for stranded-asset status.

6. The Plant's Reliance on Imported Coal Will Expose Consumers to Global Coal Market Risk

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. Rampal customers would bear the brunt of such increases.

7. The Project Is in the "Wind Risk Zone" and Within The Path of Storm Surges

The location in the "Wind risk zone" of Bangladesh represents 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

The seeming lack of contingency management plans poses a risk to plant operations.

9. The Proposed Financing of Rampal Debt Puts the EXIM Bank at Risk

While the Rampal project would expose all project promoters and consumers to financial risk, it poses specific risks to the Indian EXIM Bank. The Rampal project would constitute a large chunk of EXIM Bank's loan book, it would put the EXIM Bank's international fund-raising capacity at risk, and the very coal-fired nature of the project would create refinance risk for the EXIM Bank.

10. The Bangladesh Electricity System Is Already Losing Nearly US$1 Billion Per Year, an Unsustainable Situation the Rampal Project Will Probably Only Make Worse

The Bangladesh government in the event of the further budget deficits may no longer fully support electricity-system losses. This constitutes a significant risk to Rampal project backers and customers.

This Report Finds Also that Renewable Energy—Especially Solar Energy—Is a Commercially Viable Alternative to Rampal for Several Reasons:

1. Utility Solar Should be a Key Focus for Bangladesh, Despite Land Constraints Applying to All Major Developments

Bangladesh has a potential to generate 380TWh electricity per annum through solar PV installations and IEEFA 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.

2. Momentum in Bangladesh Is Toward Off-Grid Solar Growth

Bangladesh has one of the most successful distributed solar rooftop programs in the world. Over 4.3 million households, or 10% of the country's total households, have installed Solar Home Systems, and investment continues to grow. Rooftop solar can bring electricity immediately to the one-third of Bangladeshis who have no access to the centralized grid; it underpins a democratic, easily scalable, distributed energy system; it avoids the massive water usage, pollution, and waste-ash disposal problems that come from coal mining and thermal power generation; it does not create air and particulate pollution; nor does it bring the associated health costs; it allows speed of implementation, taking less than a day rather than a decade to

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

3. Bangladesh Has Made Gains in Grid-Connected Utility-Scale Solar Power And Stands to Gain More

The government of Bangladesh has begun to seriously pursue grid-connected solar power generation, aiming for 1.7GW of solar capacity by 2021 and 6GW by 2030. It has drawn investment capital proposals from around the world in this sector, and could move significantly faster.

4. Bangladesh Can Benefit Heavily From Trends Toward Declines in Solar Costs and Expanded Utility-Size Deployment

IEEFA sees annual solar capacity addition exceeding 60GW globally in 2016, a 15% year-on-year increase. This continues a trend of double-digit annual growth in installations driven by continuous technology innovation and the benefits of economies of scale, both of which are drastically lowering the cost of solar. There is every reason to believe that Bangladesh can benefit directly by leveraging off the major solar-installation trends established in India.

5. Solar Brings Expanded Capital Access to Global Financial Institutions

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's research indicates that the Indian establishment can better promote Indian interests by supporting a renewable-energy program in Bangladesh, to be executed by Indian firms. Such a move would significantly boost India's fledgling solar manufacturing export industry, as well as the government of India's "Make in India" program and leverage India's announcement at COP21 Paris that it will show leadership toward a global solar alliance.

Conclusion:

The proposed Rampal power plant is fraught with unacceptable risk, out of step with the times, and would set Bangladesh back. Adding imported coal-fired power capacity would expose the Bangladeshi electricity system to international coal price and currency fluctuations while renewable energy—especially solar—makes strategic sense by de-risking power generation from fuel price risk and building on the success of Bangladesh's world-leading off-grid rooftop solar program. Bangladesh can 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. The Rampal plant should be cancelled.

1.0 Rampal Power Project: Background

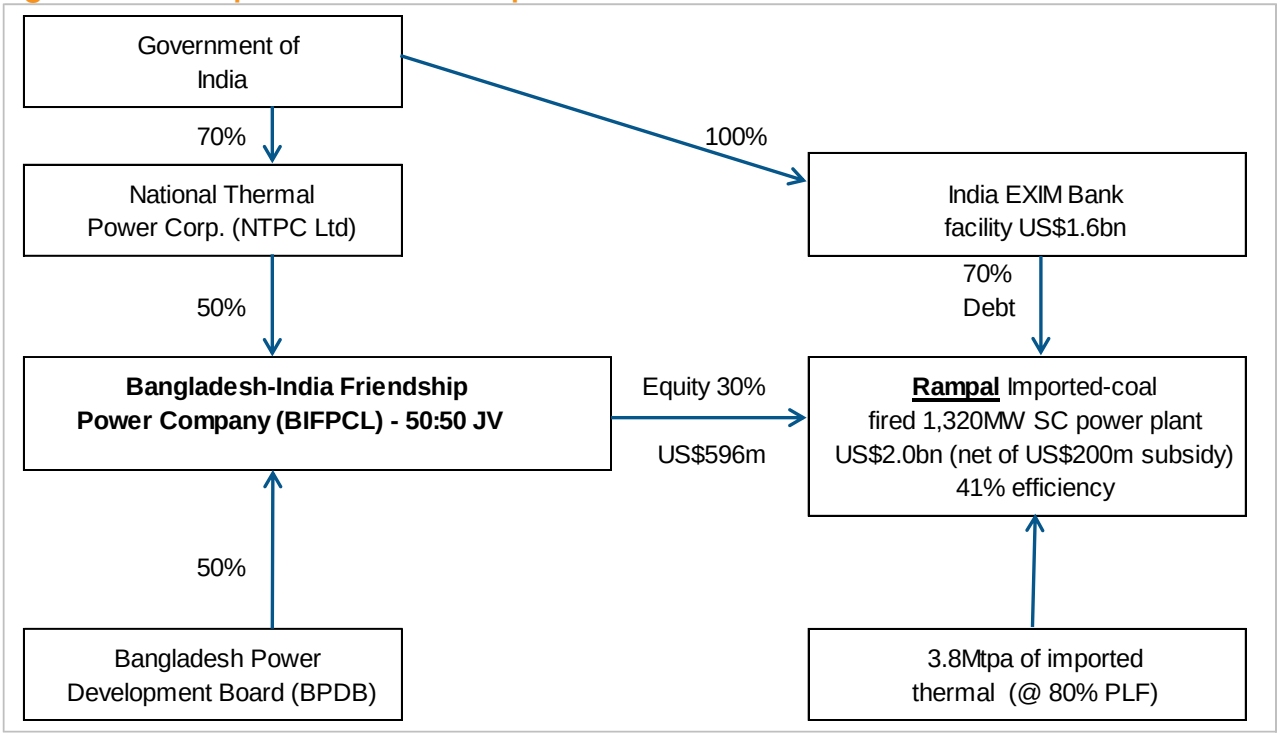
The Rampal Power Plant proposal, also known as the Maitree Super Thermal Power Project, is one of eleven coal-fired power stations planned under Bangladesh's Power Development Board (BPDB) plans for commissioning by 2021.[1][2] The proposed imported-coal-fired power plant is to be a joint venture of BPDB and India's largest power producer, NTPC Limited, under the name of Bangladesh-India Friendship Power Company Limited (BIFPCL) (Figure 1.1).

BPDB and NTPC signed a Joint Venture Agreement on Jan. 29, 2012, under which NTPC is responsible for planning, building and operating the plant. NTPC Ltd is listed on the Bombay Stock Exchange and is 70% owned by the Government of India.

The proposed project would have a capacity of 1,320 MW, with two 660-MW units, and with a provision for a Stage 2 expansion that could involve installing two more units, each with 660 MW of capacity, taking the project to a potential 2.6GW-capacity.

The most recent targeted commissioning date of Stage 1 of the project is 2020.

Figure 1.1 – Rampal Power Plant Corporate Structure



Source: Project Documents, IEEFA Estimates

In July 2015 the Bangladesh Infrastructure Finance Fund Limited (BIFFL), a company under the Bangladesh Ministry of Finance, provided a pre-financing capital commitment of US$200 million to the project to cover development costs incurred before financial close.[3]

[1] EIA – Center for Environmental and Geographic Information Services
[2] Rampal Project – Transparency International Bangladesh, https://www.ti-bangladesh.org/beta3/images/2015/es_ffs_coal_15_en.pdf
[3] http://print.thefinancialexpress-bd.com/2015/07/06/99389

The official estimate of the total capital cost of the project has escalated over time and currently stands at US$1.82 billion. IEEFA would suggest a further capital cost blow out to at least US$2bn is most likely.

Equity capital is proposed at 30% of the total, with 50% of the equity owned by the Bangladesh Power Development Board (BPDB) and 50% by NTPC Ltd of India. Debt is proposed to cover 70% of the capital cost. All of the debt financing would be provided by loans from the Indian Export Import Bank (Figure 1.2).

Figure 1.2 – Rampal Power Plant Capital Structure (US$m)

Capital Structure	US$m	Split	Split	US$m
Local currency	112			
Foreign currency	1,488			
Indian ImEx Bank - Buyer's Credit Facility	1,600			
Buffer?	210			
Debt required	1,390		70%	1,390
NTPC Ltd of India	298	50%		
BPDB of Bangladesh	298	50%		
Total Equity	596		30%	596
Total cost (US$m)				1,986

Source: Project Documents, IEEFA Estimates

Location and Land

The proposed 1,834-acre plant site is on the Passur River in the Ganges tidal floodplain in the southwest of Bangladesh. The site is 14 kilometres north of the Sundarbans mangrove forest, a UNESCO World Heritage site and one of the last such forests in the world. The site is 23 kilometres southeast of the city of Khulna (Figure 1.4).

The site averages 2 metres above sea level, an obviously key financial and operating risk factor given that it is in a tidal delta where the historical maximum surge factor reported is 5 metres.[4] A key construction requirement is to raise the average site elevation by 5 metres, but the site would remain at risk of flooding should sea levels rise or should an extreme weather event occur. Initially, the site was planned to be elevated to a height of 5.5 metres above mean sea level[5] but NTPC lowered the planned site elevation.[6] [7]

We consider the site's location and elevation an extreme risk over the medium to long term, in that ash ponds and infrastructure could easily be washed away.

Further, the site's remoteness is a risk factor.

In March 2016, the Executive Committee of the National Economic Council (ECNEC) of Bangladesh approved a project to build a four-lane road is to the proposed plant location

[4] EIA, January 2013, page xxxi
[5] http://ep-bd.com/online/details.php?cid=10&id=17782
[6] http://bifpcl.com/new/wp-content/uploads/2014/09/4.-Khulna-FR-Final-Rev-D-Dec-12.pdf, page ii.
[7] http://www.bpdb.gov.bd/download/bangladeshIndiaFriendship/TenderDocument/FTS%20Section-V/B9-Civil-Works-Specification.pdf, page B9-61

(at a cost of Tk1,858m[8]). This decision expanded on a January 2014 approval to construct a two-lane road.[9]

Figure 1.3 - Project Timeline

	Event	Date
**	BPDB + NTPC sign MoU	August 2010
**	Land acquisition order for 1,834 acres	27 December 2010 Prior to the EIA
**	Department of Environment approved land clearing.	May 2011
**	JV signed by NTPC and PDB	29 January 2012
**	Environmental Impact Assessment (EIA) released by Centre for Environmental and Geographic Information Services (CEGIS)	January 2013
**	A public consultation was arranged by PDB	12 April 2013
**	Power Purchase Agreement (PPA) and Implementation Agreement signed with BPDB	20 April 2013
**	EIA (revised) released by CEGIS	July 2013
**	Norwegian Government Pension Fund Global Council of Ethics recommends the SWF divest NTPC * Norwegian SWF divests NTPC	2014 → February 2015
**	The Bangladesh Planning Commission refused approval citing the project is not a public Bangladesh entity.	September 2014
**	BIFPCL invite bids for EPC Notice Inviting Tender (NIT) delayed	November 2014 → February 2015
**	EPC construction bid submission deadline delayed	18 May 2015 → 18 July 2015 → 22 September 2015
**	Bangladesh Infrastructure Finance Fund Limited (BIFFL) provided a pre-financing capital commitment of US$200m	July 2015
**	Conclusion of bidder selection- finalists were: * Marubeni Corp & L+T * Harbin Electric Int. Co * ETERN * Bharat Heavy Electricals Limited (BHEL)	January 2016
**	EPC contract informally awarded BHEL	February 2016
**	Financial Close 7-12 months away	Due mid 2016 to early 2017
**	Commercial Operation * Original target date * Completion and start commissioning 41 months after financial close.	Originally end 2018 → Latest target 2020

[8] http://www.albd.org/index.php/en/updates/news/3549-ecnec-approves-16-development-projects
[9] http://print.thefinancialexpress-bd.com/2014/01/27/15783/print

The government's Environmental Impact Assessment (EIA) report on the plant proposal highlighted its remote location as a concern, stating that "the area is remotely accessible due to poor road and communication network. Pedestrian access through some rural earthen roads, which easily become muddy and damaged due to rain, is the modest mode of communication."

Fuel and Resources

Should the Rampal plant become operational, 3.8 million tons per annum (Mtpa) of coal would need to be required to keep the plant running at an 80% Plant Load Factor (PLF) (80% of 4.72Mtpa). The plant is being developed to utilize coal with calorific value of 5,800-6,100 Kcal/kg imported from Indonesia, Australia and/or South Africa.[10]

In May 2016, it was reported that the plant may utilise coal from China, Indonesia or the state-run Coal India Limited.[11] However, since Indian coal is low energy content and high ash, the quantity of coal required would be around 6.0Mtpa, implying ~4,700Kcal/kg coal.

The plant would rely for water on the nearby Passur River.

Coal Transportation

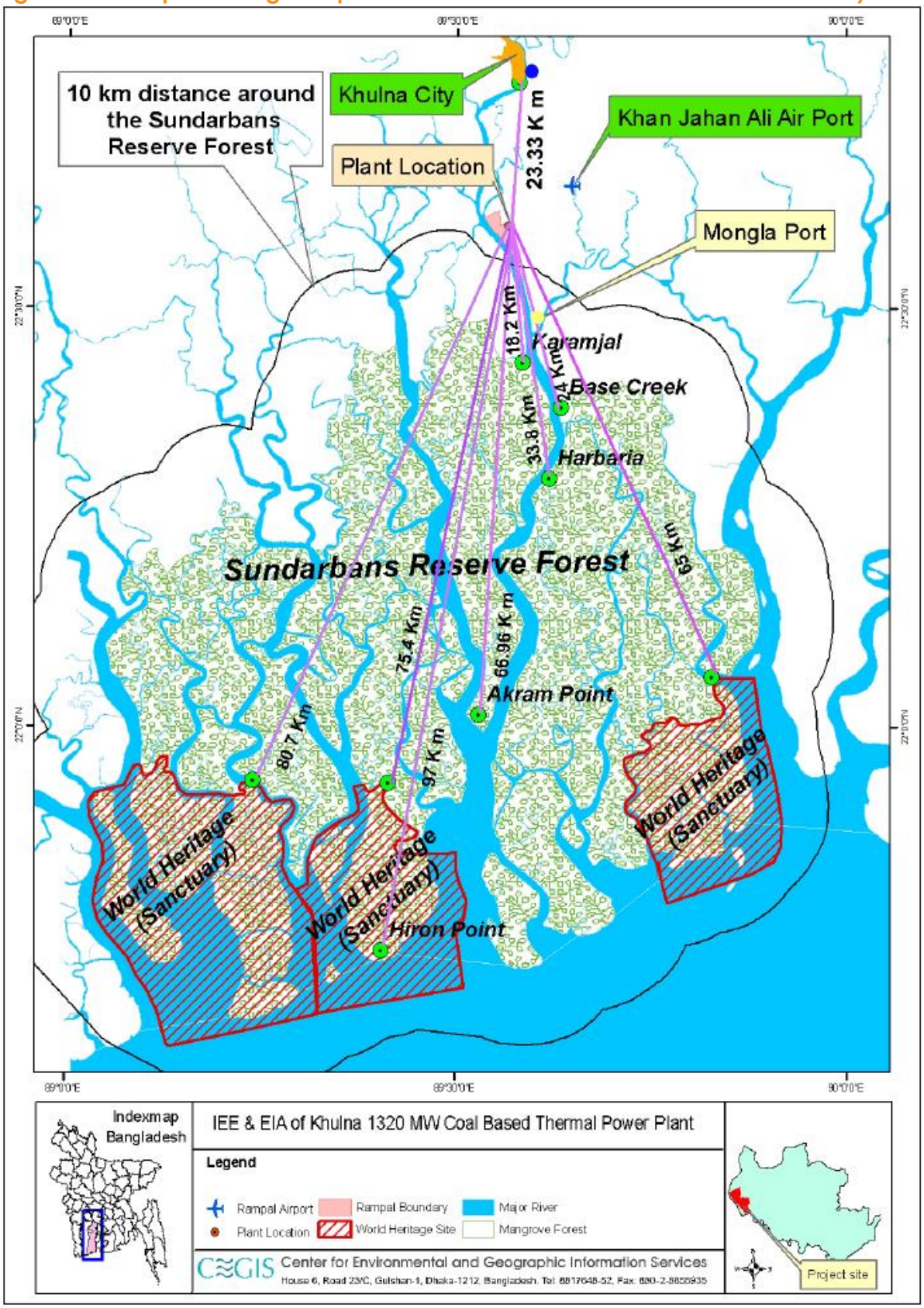
Coal imported to fuel the plant would be transported to the region on ocean-going ships. The ships would be anchored at Akram Point, which is located within the Sundarbans. Transhipment from these larger ships to smaller covered barges would occur at Akram Point. Coal would be taken from there on the Passur River to the Rampal project site, "making a total of 400-500 trips per year directly through the Sundarbans."[12] BIFPCL would need to conduct dredging and widening of a 36-kilometre stretch of the Passur River to make the river navigable between Akram Point and the project site.[13]

Community Relocation

The EIA report for the Rampal plant states that the project would require displacement of 150 households.[14] However, other sources state that the number of people displaced would be much higher, and that 400 households have already been displaced.[15] Some media reports state that traditional landowners having been compensated inadequately[16] (landowners were given compensation of Tk270,000 per acre for the land, whereas the market rate of nearby land is on average Tk600,000 per acre).

[10] EIA, January 2013, Page 108
[11] http://www.business-standard.com/article/companies/coal-india-hopes-to-win-orders-from-bangladesh-116053000752_1.html
[12] http://www.banktrack.org/ems_files/download/rampal_equator_principles_full_analysis_pdf/rampal_equator_principles_full_analysis.pdf, page 3
[13] EIA, January 2013, Page 110
[14] EIA, January 2013, Page 269
[15] http://www.banktrack.org/ems_files/download/rampal_equator_principles_full_analysis_pdf/rampal_equator_principles_full_analysis.pdf
[16] http://www.thedailystar.net/backpage/no-rampal-power-project-145024

Figure 1.4 – Map Detailing Rampal Power Plant Location and Distance From Key Features



Source: Environmental Impact Statement by CEGIS, January 2013

1.1 Profile of Main Corporate Entities

Bangladesh Power Development Board (BPDB)

BPDB is a statutory body under Bangladesh's Ministry of Power, Energy and Mineral Resources, responsible for managing the Bangladeshi electricity system. The key responsibilities of BPDB are:

i. Generation of electricity through its own plants;

ii. Purchase of electricity from power generators in Bangladesh;

iii. Sale of electricity to Utilities;

iv. Distribution of electricity in Bangladesh; and

v. Preparation and implementation of Generation and Distribution plans

The total installed capacity under BPDB and its subsidiaries in 2014-15 was 5.4GW out of a total system capacity of 10.9GW. The number of customers served was 3.2m. BPDB had total assets of Tk534bn (US$6.8bn) and revenues of Tk212bn (US$2.7bn), while it posted losses of Tk72.8bn (US$0.9bn) in 2014-15.[17]

Profile of NTPC Ltd

NTPC Ltd (NTPC) is India's largest electricity generation company, with a total installed capacity of 47.2GW out of India's total electricity generation capacity of 298.0GW.[18] NTPC is a publicly listed company, owned 70% by the Government of India[19] —the top 20 shareholders of the company are listed in Annexure III. The company had assets of INR1,971bn (US$29.4bn) and profits of INR103bn (US$1.5bn) in 2015-16.

While over 40GW of NTPC's capacity is based on coal power,[20] the company has undertaken a substantial strategic shift and is now a leading proponent and facilitator of India's renewable energy capacity expansion plans. NTPC has 310MW solar projects commissioned, with plans to add 1GW capacity by 2017[21] and a 15GW in 3 tranches in the medium term.[22] NTPC has also allocated 2.5GW capacity of solar plants under the state specific bundling scheme as part of the Batch II of the Phase II of the National Solar Mission.[23]

Export Import Bank of India (EXIM Bank)

The Export-Import Bank of India (EXIM Bank), owned 100% by the Government of India, was established to finance, facilitate and promote India's international trade and investment. EXIM Bank provides Export and Import credits, as well as loans for exporting units. EXIM Bank

[17] http://www.bpdb.gov.bd/download/annual_report/Annual%20Report%202014-15.pdf
[18] http://www.ntpc.co.in/en/media/press-releases/details/record-generation-ntpc-stations-fy-16
[19] http://www.bseindia.com/corporates/shpSecurities.aspx?scripcd=532555&qtrid=89.00
[20] http://www.ntpc.co.in/en/power-generation/coal-based-power-stations
[21] http://www.ntpc.co.in/en/power-generation/renewable-energy-and-distributed-generation
[22] http://www.pv-magazine.com/news/details/beitrag/indian-state-utility-ntpc-given-green-light-for-15-gw-solar-plan_100018354/#axzz494JWxMzb
[23] http://www.bridgetoindia.com/blog/another-day-another-auction-indian-developers-on-a-winning-spree/

had a total loan portfolio of Rs1,025bn (US$15.2bn) in 2015-16, while it made profits of Rs3.2bn (US$46.9m). See Annexure IV for further details on EXIM Bank.

EXIM Bank has reportedly backed a bid by Bharat Heavy Electrical Limited (BHEL) for the supply of equipment to the Rampal plant and is currently in the process of providing the entire debt portion of the capital structure for the Rampal plant, a stated amount of US$1.6bn. EXIM Bank relies fairly heavily on international borrowings for its own funding—49% of the total funding has come from international borrowings. However, as highlighted in Point 9 of Section 3.2, financing this plant exposes EXIM Bank to a risk of losing access to this funding source.

We believe that EXIM Bank would better deliver on its mission by—rather than developing a coal based power plant—supporting NTPC and BPDB in initiating a program by awarding BHEL an EPC (engineering, procurement, construction) contract to install a series of solar plants in Bangladesh. Not only would such backing significantly boost India's fledgling solar manufacturing industry, it would augur well for the Indian government's "Make in India" program. EXIM Bank has commenced work in the renewable space in 2015 launching its first US$500m green bond.[24]

Bharat Heavy Electricals Limited (BHEL)

BHEL is India's leading power plant equipment manufacturer, with 62% of India's coal-based thermal utility installations[25] and power generation equipment installations of over 150GW.[26] Outside the power sector, BHEL also manufactures industrial systems and products for a variety of industries. BHEL has contracted 48 supercritical steam generators—the same technology proposed to be used in Rampal power plant. BHEL is a publicly listed company, with 63% ownership by the Indian Government.[27] The company posted sales of Rs263bn (US$3.92bn), while posting losses of Rs9.0bn (US$134m) in 2015-16.

While BHEL has focused historically on thermal power generation equipment, it has lately started to invest in solar power installation as well, in accordance with the policy direction of the Indian government.[28] As part of this endeavour, it has recently won an order from NTPC to set up a 50MW solar plant in the Indian state of Madhya Pradesh.[29]

[24] http://www.eximbankindia.in/node/1393
[25] BHEL Annual Report 2014-15, Page 15
[26] BHEL Annual Report 2014-15, Page 13
[27] http://www.bseindia.com/corporates/shpSecurities.aspx?scripcd=500103&qtrid=89.00&Flag=New
[28] http://www.pv-tech.org/news/indias-bhel-told-to-step-up-solar-activity-by-minister-bags-50mw-epc-order
[29] http://economictimes.indiatimes.com/industry/energy/power/bhel-bags-rs-282-crore-order-from-ntpc-for-50mw-solar-plant-in-mp/articleshow/51824345.cms

1.2 Current Plant Status

In February 2016, the main contract for the engineering, procurement and construction (EPC) of the Rampal plant was reported to have been allotted to India's state-run Bharat Heavy Electricals Limited (BHEL),[30] although no contract has as yet been signed, as per BHEL's response to a query by the Bombay Stock Exchange.[31]

The managing director of BIFPCL stated in an interview that financial close would be done on an accelerated rate, to ensure that it is completed in 7 months, as opposed to the usual 12 months, concluding that financial close for the plant was targeted to be achieved by July 2016.[32]

However, we note that there has been a series of delays since the project was first conceived in 2010, suggesting financial close will not occur before 2017 at best.

Financial close became more difficult after one Norwegian pension fund pulled out of their investment in NTPC and three French banks announced their decision not to fund the Rampal project.[33]

In March 2016 the Indian government's external lending arm, the EXIM Bank, stated in a press release that it was "in the process of extending a Buyer's Credit of US$1.6bn" to BIFPCL[34] thereby looking to back BHEL's offer with a massively subsidised loan covering a full 70% of the project's capital costs. This press release also serves as a partial confirmation of the likely capital cost escalation for the project, given that this debt facility was expected to be US$1.5bn as recently as July 2015.

Forest and Environment Minister Anwar Hossain Manju said that as of June 2016 the Directorate of Environment has yet to give "no objection certificate" (NOC) for construction of Rampal coal-fired power plant.[35]

Once financial close has been achieved—assuming that it is—formal construction can begin, although some reclamation work and site preparation is already under way. IEEFA models that the plant is only likely to reach a formal commissioning by 2020 at the earliest and that operation at full capacity will not occur until the financial year 2021.

A total of 1,834 acres of land has been acquired by the government for the construction of the power plant. Reclamation and land development for the main plant area is under way and connecting roads are under construction. Power supply for construction is already available.

[30] http://www.vccircle.com/news/power/2016/02/09/backed-aggressive-financing-india-secures-16b-bangladesh-power-project-order
[31] http://www.bseindia.com/corporates/anndet_new.aspx?newsid=fb210b96-2aa2-47df-ad4e-bf169bbfe7b8
[32] http://ep-bd.com/online/details.php?sec=1&cid=10&id=19414
[33] http://www.theguardian.com/environment/blog/2015/jun/25/french-banks-say-no-to-bangladesh-coal-plant
[34] http://www.eximbankindia.in/press-releases
[35] http://www.thedailystar.net/city/rampal-power-plant-project-yet-get-environmental-clearance-minister-1236952

1.3 Environmental Issues

The plant site is proposed at the edge of the Sundarbans, the world's largest mangrove forest. The Sundarbans, a part of which lies in India, is a national conservation area in Bangladesh, a designated Ramsar Conventions wetlands and part of the UNESCO World Network of Biosphere Reserves. The Sundarbans includes a UNESCO World Heritage site composed of three separate wildlife sanctuaries on the Bangladeshi side and one on the Indian side.

The government's Environmental Impact Assessment (EIA) notes an additional major environmentally sensitive zone situated to the north of the proposed project.

These designations combined are clear indications that the area is exceptionally sensitive to environmental impacts. The Sundarbans area is rich in biodiversity and is home to Bengal tigers and river dolphins.[36]

To go forward with the Rampal project, BIFPCL would need to conduct dredging and widening of a 36-kilometre stretch of the Passur River that would involved moving 32.1 million cubic metres of material to make the river navigable between Akram Point and the Rampal project site.[37] In addition, maintenance dredging would be required annually for the life of the project.

Questions Around the Environmental Impact Assessment of the Plant

The BPDB asked the Center for Environmental and Geographic Information Services (CEGIS), a trust under the Bangladeshi Ministry of Water Resources, to conduct an Environmental Impact Assessment (EIA) study for the plant. The study was completed and submitted to BPDB in January 2013.

Questions have been raised over whether the study was truly independent and whether it presented a fair assessment of the environmental risks associated with the project or the effectiveness of proposed risk management plans.[38] (See Annexure II for more detail).

The Norwegian Government Pension Fund Global's Council of Ethics report, for one, is critical of the EIA report of the plant for lacking in details on:

- how accidents like shipwrecks would be handled;
- responsibilities of various parties in such accidents;
- resources available for dealing with accidents through the mangrove belt; and
- risk assessments or contingency plans.

Moreover, under the provisions of IMO (International Maritime Organisation) and MARPOL (International Convention for the Prevention of Pollution From Ships) conventions, both of which have been ratified by Bangladesh, shipping companies will bear legal liability for consequences of accidents at sea, putting the companies at risk in this case.

[36] EIA Report, January 2013, Page xxviii
[37] EIA, January 2013, Page 110
[38] Refer Annexure II of this report.

One outside group that has studied the proposal, the Norwegian Government Pension Fund's Council of Ethics, notes that EIA studies normally are done by consultants hired by developers. Authorities may use these reports to impose requirements on developers. However, in this case, the report was prepared by CEGIS, which operates under the Ministry of Water Resources. It is unclear whether NTPC or the joint venture are responsible for the report. This lack of clarity undermines confidence in the assertion "that the EIA provides an objective, comprehensive analysis."

Rampal Project Is in the 'Wind Risk Zone'

The government's Environmental Impact Assessment study notes that the Rampal plant would be in the "wind risk zone" of Bangladesh, a zone that has seen 16 cyclones in the past 25 years.[39] These cyclones are associated with storm water surges, one of which reached a height of 10 metres in November 2007, as per data compiled by Bangladesh Metrological Department. In comparison, the mean elevation of the plant site is 0.8752 metres above mean sea level.[40] Inundation of the plant and waste ash slurry ponds during such cyclones is a major risk.

Although the EIA acknowledges this risk, it states that the site is being developed for a "historical maximum surge height" with a final finished level of 5.5 metres. However, NTPC has reduced this tiny margin of error by adjusting plans by allowing a 5-metre finished level. [41] This level is based on "local community perception," and contradicts data recorded by the Meteorological Department.

The Norwegian Government Pension Fund's Council of Ethics recommends excluding the NTPC from its investment holdings and notes that the height of storm surges is expected to rise materially in the years ahead.

Question on the Plant's Infringement of Sundarbans Ecologically Critical Area

A report on the project by the Norwegian Government Pension Fund's Council of Ethics highlights the various additional legal issues and risks associated with the proposed Rampal project. The report notes, for instance, that the Sundarbans is a national conservation area in Bangladesh, a designated Ramsar Conventions wetlands and part of the UNESCO World Network of Biosphere Reserves, and a UNESCO World Heritage site. As per Bangladeshi law, no such plants can be built within 10 kilometres of such a forest. The report quotes sources that dispute whether the proposed location of plant is within the 10-kilometre range.[42] Notably, similar projects in India would not be approved because they would violate laws against building such plants within 25 kilometres of ecologically sensitive areas like forests.[43]

[39]EIA Report, January 2013, Page 184
[40]EIA Report, January 2013, Page 80
[41] http://bifpcl.com/new/wp-content/uploads/2014/09/4.-Khulna-FR-Final-Rev-D-Dec-12.pdf, page ii
[42] See Annexure I
[43] http://environmentclearance.nic.in/writereaddata/Form-1A/HomeLinks/TGM_Thermal%20Power%20Plants_010910_NK.pdf, page 4-9

2.0 Bangladesh's Economy and Electricity Market

Bangladesh has an estimated population of 169 million,[44] making it the ninth largest country in the world by population. By area it is ranked 92nd globally, making it one of the most densely populated countries in the world.[45]

The Bangladeshi economy, identified by Goldman Sachs as one of the "Next Eleven" economies globally,[46] reports a healthy GDP growth rate of 6.32% from 2010-11 to 2014-15. In 2014-15 GDP growth was 6.55%. In terms of GDP per capita, the country is ranked a 178th in the world.[47] Bangladesh has a trade deficit, but a positive current account balance of 1% of GDP. Over the past five years, Bangladesh has witnessed a stable currency regime, with the Bangladeshi Taka (Tk) depreciating 1.3% per annum against the U.S. dollar.[48]

The government's credit rating has remained stable, with Standard and Poor's rating the country's government debt at BB- with a stable outlook since April 2010.[49] The favourable factors for the country are its relative political stability, strong economic growth projections of 6% annually and expectation of garment exports to maintain the current account in surplus. However, high inflation, a high budget deficit, debts exceeding reserves and rising competition in the international garment industry are key risks to the fiscal stability of Bangladesh.[50]

The country's budget deficit increased to 4.7% of the GDP in 2014-15, up from 4.0% in 2013-14 and 3.6% in 2012-13.[51] If this budget deficit as a percentage of GDP increases further, it may lead to a stress in the government's bond rating and the government may be forced to reduce its expenditures, like those that support electricity system losses that it currently bares. In 2012, the country faced a financial crunch due to a shortage of foreign exchange. The government's excessive borrowing was one of the reasons for this crunch.[52]

Figure 2.1 – Bangladesh Economic Statistics

GDP (Tk bn, constant 2004-05 prices)	8,249
Real GDP Growth Rate (2014-15)	6.55%
Real GDP Growth Rate (2010-11 to 2014-15)	6.32%
Bangladesh Population (m)	169
Per capita GDP(Tk)	48,821
Per capita GDP(US$)	621
Current Account Balance (Tk m)	78,745
Current Account Balance (US$ m)	1,001
Current Account Balance (% of GDP)	954.6%
Average weighted Lending rate (%)	10.91%
Tk/US$ (May 2006)	68.2
Tk/US$ (May 2011)	73.5
Tk/US$ (on 20 May 2016)	78.7
Currency Depreciation vs US$ (2011-2016)	1.4%
Currency Depreciation vs US$ (2006-2016)	2.9%

Source: Bangladesh Bank

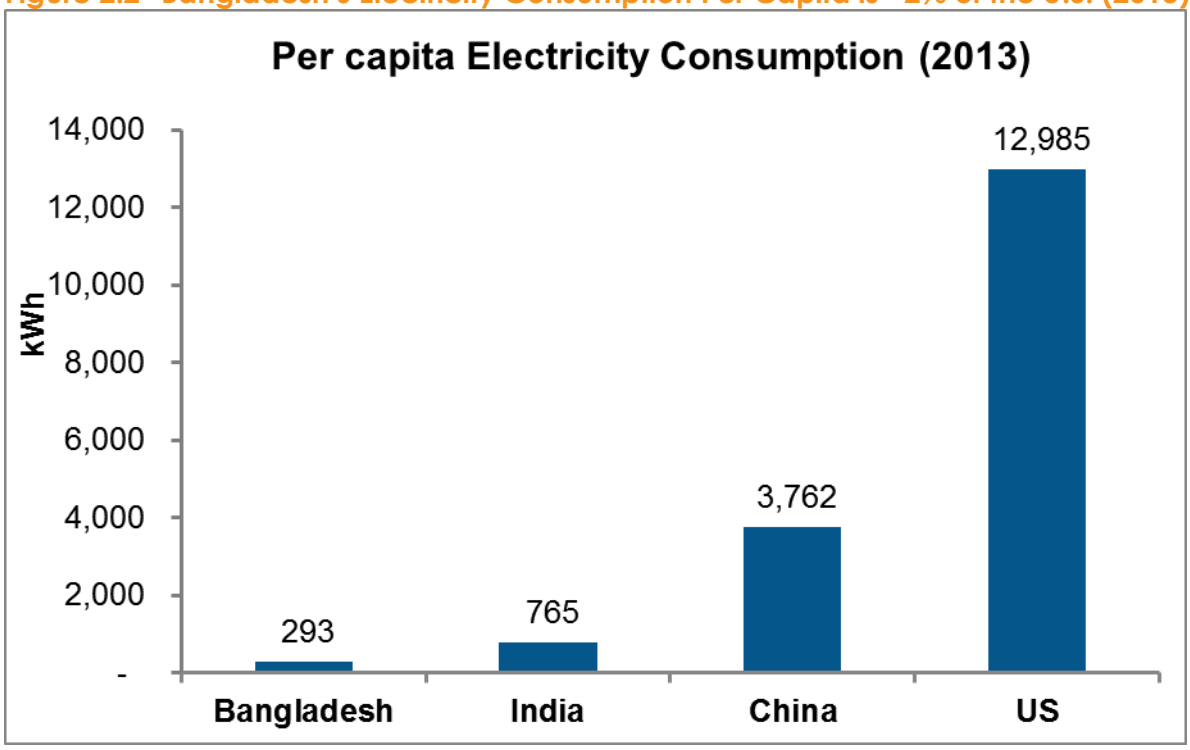
[44] https://www.cia.gov/library/publications/the-world-factbook/rankorder/2119rank.html
[45] http://statisticstimes.com/population/countries-by-population-density.php
[46] http://www.bloomberg.com/news/articles/2012-08-07/goldman-sachs-s-mist-topping-brics-as-smaller-markets-outperform
[47] https://www.cia.gov/library/publications/resources/the-world-factbook/rankorder/2004rank.html
[48] http://www.xe.com/currencycharts/?from=USD&to=BDT&view=10Y
[49] http://www.tradingeconomics.com/bangladesh/rating
[50] http://www.euromoney.com/Article/3358334/The-worlds-10-riskiest-sovereigns.html?single=true
[51] http://www.tradingeconomics.com/bangladesh/government-budget
[52] https://www.timesofassam.com/international/bangladesh-selling-sovereign-bond-to-cope-with-financial-crisis/

Current average government interest rates in the Bangladeshi financial system are 10.9%,[53] private sector lending rates are 12-13%, and both rates reflecting consumer inflation rates of 7-8% annually over the past five years.

Bangladesh Has Low Per Capita Electricity Consumption

Bangladesh is ranked 168th globally in the electricity consumption,[54] with annual per capita consumption of 293 kWh in 2013 (Figure 2.2).[55] This is only about 38% of the annual per capita electricity consumption in neighbouring India of 765kWh and it a tiny fraction of per capita consumption in the U.S. and even China.

Figure 2.2- Bangladesh's Electricity Consumption Per Capita is ~2% of the U.S. (2013)



Source: World Bank 2015 Statistics

Figure 2.3 details growth in Bangladeshi electricity production and consumption, which has averaged 8.3% annually over the past decade. Grid transmission and distribution (T&D) losses have risen to 13% over this same period. Per capita consumption has grown at 7.3% annually to 293kW in 2013 and an estimated 320kWh in 2014.

[53] https://www.bb.org.bd/econdata/bb_nsdp.php
[54] http://www.indexmundi.com/g/r.aspx?v=81000
[55] http://data.worldbank.org/country/bangladesh

Figure 2.3 – Bangladesh's electricity T&D loss rate, production & consumption (2004-2014)

Bangladesh Electricity System	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2004-2014 Average
Electricity Generation (TWh)	24.7	26.4	29.5	31.0	34.3	37.2	41.8	44.2	49.0	52.4	57.7	
Electric power T&D losses (% of output)	8.3%	7.4%	6.0%	5.2%	12.5%	11.3%	10.5%	10.2%	11.9%	13.2%	13.2%	
Electricity Consumption (TWh)	22.6	24.5	27.8	29.4	30.0	33.0	37.4	39.7	43.2	45.5	50.1	
Growth in electricity consumption		8.1%	13.4%	5.9%	2.1%	10.0%	13.3%	6.0%	9.0%	5.3%	10.1%	8.3%
Per capita consumption (kWh)	161	171	192	201	202	220	241	258	276	293	320	7.2%
GDP Growth (%) - World Bank	5.2%	6.5%	6.7%	7.1%	6.0%	5.0%	5.6%	6.5%	6.5%	6.0%	6.1%	6.2%
Ratio of Electricity demand to GDP growth		1.24	2.01	0.84	0.35	1.98	2.38	0.93	1.38	0.88	1.67	1.34

Source: BP World Statistics 2015, World Bank Country Database

Heavy Dependence on Domestic Gas

The Rampal power plant is part of the country's Power Sector Master Plan 2010, which aims to expand and diversify the Bangladeshi electricity sector away from the current dominance of gas- based power generation toward a higher percentage of imported-coal-based power generation, at least partly owing to domestic gas supply limitations.

In April 2016, Bangladesh had a total installed power capacity of 12.3GW, with 600MW of power imported from India. Of the country's 12.3GW of installed capacity, the public sector contributed 6.4GW and the private sector contributed 5.9GW.[56] The electricity system is primarily dependent on natural gas, which contributes 61.8% of total generating capacity, followed by furnace oil and diesel at 21.7% and 7.8% respectively.

The gas-based development of the electricity generating system to date has been driven by the large domestic availability of natural gas. In March 2015, Bangladesh had 14.3 trillion cubic feet of gas reserves.[57] It also reflects the lack of success of developing domestic thermal coal mining.

Bangladesh Has Failed to Utilize Its Domestic Coal Reserves

Bangladesh has coal reserves of over 2,000 million tonnes (Mt),[58] [59] of which about 1,000Mt are considered economically viable for mining. [60] However only one coal mine—Barapukuria—is operational. It has reserves of 300Mt, and produces 1Mtpa of coal. Most of the coal from the mine goes to the only operational coal-fired power plant in the country, Barapukuria plant, which has a capacity of 250MW.[61] Barapukuria mine has produced 7.6Mt

[56] http://www.bpdb.gov.bd/bpdb/index.php?option=com_content&view=article&id=5&Itemid=6
[57] http://bdnews24.com/business/2015/06/15/bangladesh-s-gas-reserves-14.32-trillion-cubic-feet-until-march-bipu
[58] http://www.gsb.gov.bd/rvedr/index.php?option=com_content&view=article&id=9&Itemid=10
[59] http://www.gcmplc.com/resources and http://www.gcmplc.com/news-announcements
[60] http://en.banglapedia.org/index.php?title=Coal
[61] http://www.petrobangla.org.bd/oper_mining.php

of coal to date,[62] well short of a 1998 projection that it would be able to produce 30Mt coal, a gap that highlights typical delays and timetable slippage inherent in coal power.[63]

Efforts to develop another domestic coal deposits, in the Dinajpur District of Northwest Bangladesh by way of the 15Mtpa Phulbari Coal project, have yielded little progress. Coal reserves in the area are 572Mt, and in addition to the mine proposal, a 250MW mine-mouth coal-fired power plant has been proposed. Owned by GCM Resources Plc, which is listed on the London Stock Exchange, the projects remain underdeveloped due to government-approval delays and significant community resistance that has forced potential funders of the project like Asian Development Bank to pull out of proposals to finance the plant.[64] The plant's Feasibility Study and Scheme of Development is still awaiting government approval nearly 11 years after it was submitted.[65] The project was first conceived with BHP involvement in 1984, and GCM so far has invested £38m. The delay highlights the typical delay risks coal-based projects face.

Electricity Supply-Demand Mismatch

Bangladesh's electricity sector is plagued by a mismatch between demand and supply, owing to gas availability issues as well as insufficient investment in generating capacity.

Despite having large gas reserves, Bangladesh has not been able to produce enough gas to meet demand. As per the government-owned Bangladesh Oil, Gas and Mineral Corporation ("Petrobangla"), demand for gas in 2015-16 is estimated to be 3,800 million cubic feet per day (mmcfd). In comparison, the production of gas stood at 2,330mmcfd in January 2014.[66] This demand-supply gap has led to a situation in which power capacity to the tune of 603MW is starved for fuel, resulting in frequent power cuts.[67]

Another reason for the interruptions in power supply is that a large part of the installed capacity requires shut downs for maintenance, even though the situation has been eased recently some by newer capacity additions.

Power-supply issues aside, Bangladesh suffers from power transmission issues, owing to its fragile grid, which reaches about 74% of the population.[68] Bangladesh faced a major blackout due to grid failure in 2014.[69] Since then, grid problems of lesser magnitude have persisted.[70]

Figure 2.4 details the predominance of gas-fired power generation in the Bangladesh electricity system alongside the rising reliance on expensive imported furnace oil and diesel fuels due to growing domestic gas shortages. The lack of diversification is clear, as is the absence of renewable energy.

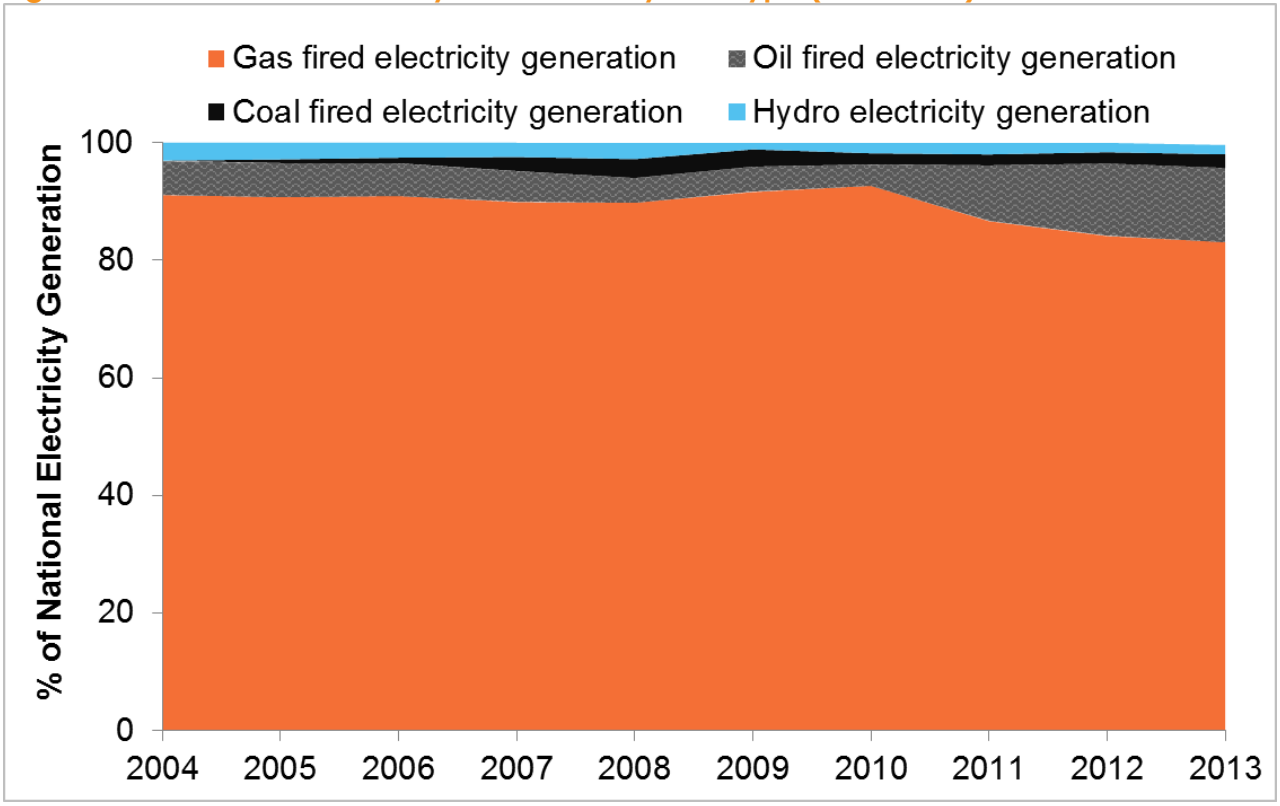
[62] http://www.bcmcl.org.bd/index.php?page=production_statistics
[63] http://www.thedailystar.net/news-detail-90796
[64] https://banglapraxis.wordpress.com/2008/04/04/press-release-asian-development-bank-pulls-out-of-controversial-phulbari-coal-project-in-bangladesh/
[65] http://www.gcmplc.com/project-status
[66] http://www.petrobangla.org.bd/petro_success.pdf
[67] http://www.dhakatribune.com/bangladesh/2015/mar/22/load-shedding-wont-improve-year
[68] http://www.bpdb.gov.bd/download/annual_report/Annual%20Report%202014-15.pdf
[69] http://www.reuters.com/article/bangladesh-power-failure-idUSL4N0SR0AT20141101
[70] http://www.dhakatribune.com/bangladesh/2015/nov/01/power-grid-vulnerable-ever

Figure 2.4 – Source of Electricity Capacity By Fuel Type (MW, May 2016)

Capacity	MW	% of total
Coal	250	2.1%
Gas	7,694	64.3%
Hydro	230	1.9%
Wind	2	0.0%
Utility scale solar	0	0.0%
Distributed rooftop solar	158	1.3%
Furnace Oil	2,675	22.4%
Diesel	956	8.0%
Domestic Installed Capacity	**11,965**	**100.0%**
Imports - India	600	
Total Generation Capacity	12,565	

Source: Bangladesh Power Development Board, IEEFA calculations

Figure 2.5 – Source of Electricity Generation By Fuel Type (2003-2013)

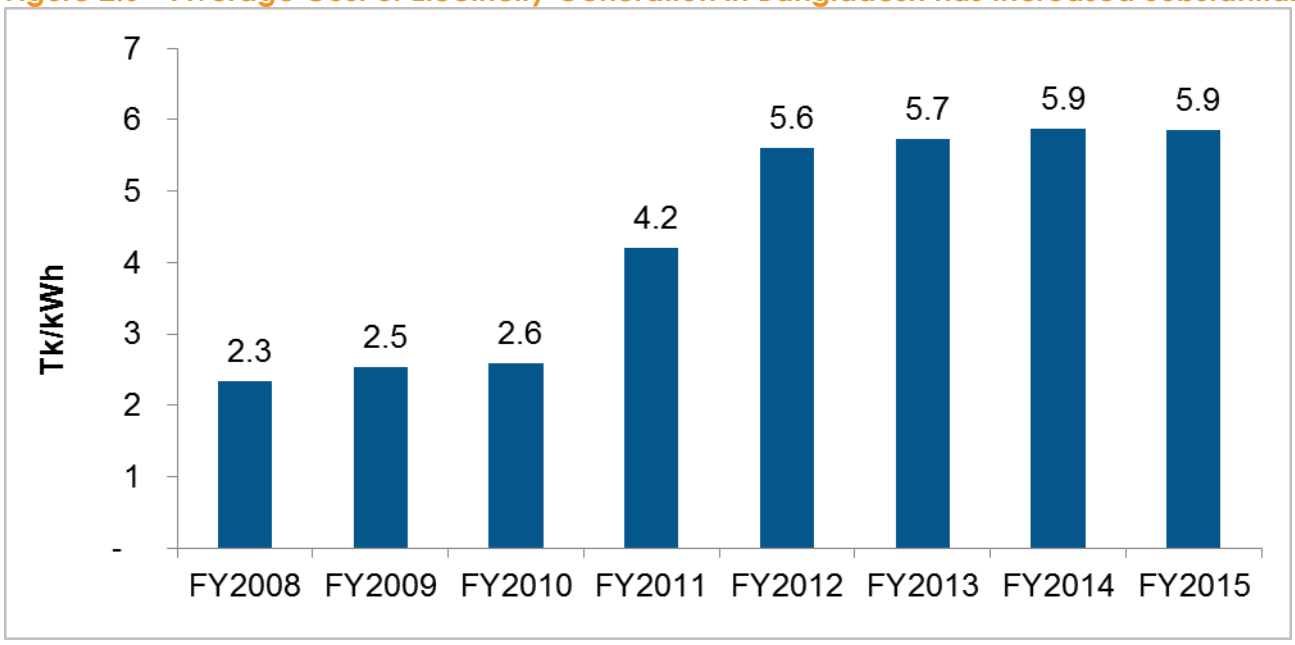


Source: World Bank Statistics

Bangladesh's Electricity System Is Riddled With Losses and Subsidies

The electricity sector in Bangladesh has seen a steep increase in power generation costs in recent years. Average costs of electricity production have increased at an annualized rate of 17.8%, rising from Tk2.6/kWh (US3.3c/kWh) in 2009-10 to Tk5.9/kWh (US7.5c/kWh) in 2014-15.

Figure 2.6 – Average Cost of Electricity Generation in Bangladesh has Increased Substantially



Source – Bangladesh Power Development Board Annual Reports

The rising cost of generation has put pressure on the already troubled Bangladeshi power system and has led to the Bangladesh Power Development Board (BPDB) posting massive losses over 2008-2015. In 2007-08 BPDB lost Tk6.6bn (US$96m), or US$53.9 per customer. Those loses had increased 10-fold by 2014-15, when BPDB lost Tk72.8bn (US$937m), or US$296.7 on each customer.

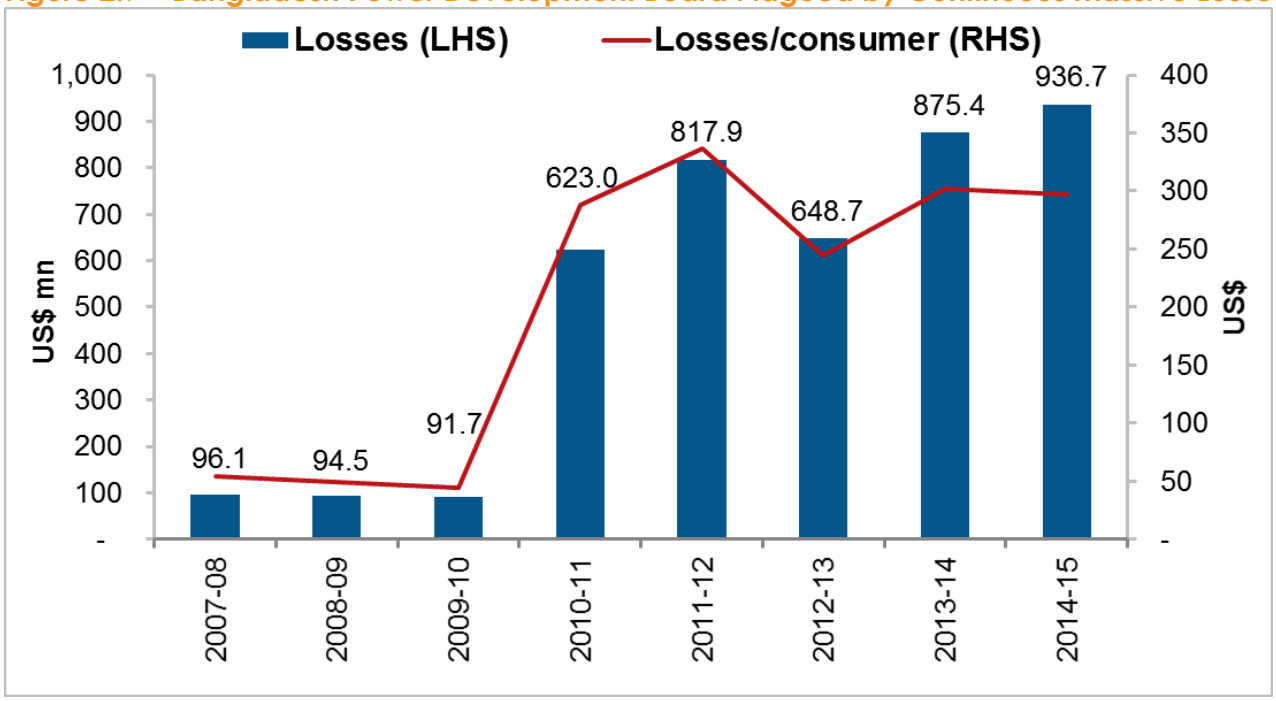
The losses reveal how electricity in Bangladesh depends on subsidies at multiple levels. This phenomenon has been examined by The International Institute for Sustainable Development (IISD).[71]

1. All input fuels for electricity generation, i.e. natural gas, furnace oil, diesel and coal, are subsidised;
2. Bangladesh Power Development Board (BPDB) sells electricity to six distribution companies at lower-than-generation cost;
3. The Bangladesh government provides loans to the BPDB at interest rates that are lower than the market rate in exchange for BPDB selling electricity to distribution companies at lower-than-generation cost;

[71] https://www.iisd.org/gsi/sites/default/files/ffs_stakeholders_bangladesh.pdf

4. Electricity tariffs for certain consumer segments, especially residential consumers and farmers, are lower than production costs; and
5. Industrial and commercial segments pay higher tariffs to compensate for the losses incurred due to lower-than-cost tariffs paid by residential and agricultural sectors.

Figure 2.7 – Bangladesh Power Development Board Plagued by Continuous Massive Losses



Source – Bangladesh Power Development Board Annual Reports

These subsidies amounted to nearly 0.9% of GDP in FY2012 as per IISD's estimates. They especially benefit lower middle-income groups in Bangladesh but fail to benefit many of the poorest people in Bangladesh, who are off the grid entirely and unable to access richly-subsidised electricity. These subsidises, all in all, distort the free market and leave less government resources for development of other important areas of the economy. By artificially keeping retail electricity prices low, the subsidies also act as a barrier to the cost effectiveness of distributed rooftop solar and energy efficiency. The ongoing losses also act as a major obstacle to global financial investment inflows, given the unsustainable nature of the current electricity pricing structure and the inevitability of policy changes. They also create non-bankable counterparty risk.

The Bangladesh grid transmission and distribution system reported electricity loss rates of 14% in 2014-15,[72] up from 6-8% a decade ago.[73] This also puts significant financial pressure on any electricity system planning utility scale projects as an alternative to distributed generation alternatives (refer Section 4).

[72] Bangladesh Power Development Board Annual Report, 2015
[73] http://data.worldbank.org/country/bangladesh

2.1 Power System Master Plan

To counter the plague of power outages and to support continued economic growth, Bangladesh has adopted a major expansion plan to add power-generating capacity. Aims of the plan include diversifying Bangladesh's electricity generation away from gas-fired plants that are limited by fuel supply constraints and to improve Bangladesh's energy security.

Under the Power Sector Master Plan (PSMP-2010) formulated in 2010, Bangladesh has added 6.5GW of power generation capacity, and plans to add an additional 18.4GW by 2021 (7.0GW of additional coal-fired and 5.8GW of gas-fired capacity). PSMP-2010 aims to reduce dependence on gas-based power to 44.0% by 2021 (down from about 62% today), primarily by adding imported-coal-fired power, whose share in the electricity system is projected to rise to 22.3% by 2021. This is in addition to 1.7% domestic-coal-fired capacity and 7.9% capacity imported from India, making for a total of 31.9% dependence on coal-fired capacity by 2021 (up from about 2% today).

The PSMP-2010 envisions solar power to contributing 5.7% and wind power 4.5% to the electricity system by 2021. The PSMP-2010 recommends a system by 2030 that is 50% coal-based, 25% natural gas-based and that get about 25% of its power from oil, nuclear and renewable-based power.[74]

The PSMP-2010 strategy has five key objectives:[75]

1. To actively develop domestic resources;
2. To improve energy security by building electricity-generation diversity;
3. To move toward a low-carbon society by introducing modern technology, by improving thermal power plant efficiency (by an average of 10% by 2030), and by building energy efficiency;
4. To ensure a stable electricity through energy-grid enhancements; and
5. To build efficient and effective organizations and capacities.

IEEFA sees construction of the Rampal power plant as a barrier to most of these objectives.

Building an imported-coal-fired power plant is contrary to the first objective. Using out-dated supercritical (SC) technology is contrary to the third objective. The Rampal project is not a grid enhancement and therefore does not meet the fourth objective. Relying on multi-billion dollar subsidies fails the fifth objective.

While proponents will argue that Rampal helps meet the second PSMP-2010 objective, it would work overall to thwart the collective objectives and when considered in conjunction with all of the environmental, health and safety issues relating to the proposed site. As such, IEEFA would consider that this project proposal is not in the best interests of the citizens of Bangladesh and be cancelled in favour of a series of cost-effective utility and distributed rooftop solar developments that best leverage India's growing construction and financing capability.

[74]Power System Master Plan (PSMP 2010)
[75] http://www.albd.org/index.php/en/resources/special-reports/1336-powering-bangladesh-s-future-story-of-electricity

An Emphasis on Renewable Energy Has Been Initiated

In October 2015, the chairman of the Bangladesh Energy Regulatory Commission, A. R Khan, said the government should replicate the renewable energy transformation under way in Germany and projected Bangladesh would have 6GW electricity from solar generation by 2030.[76]

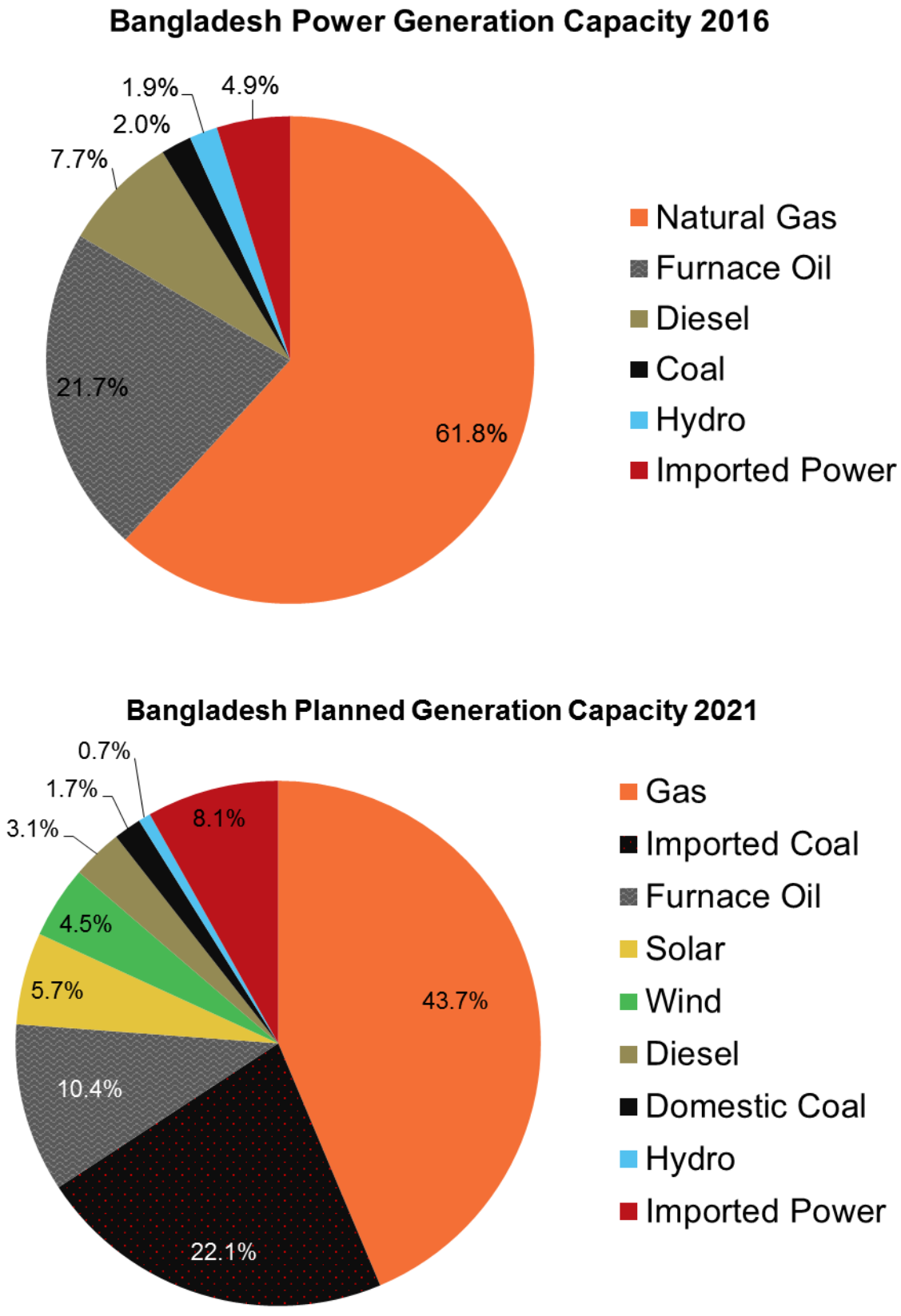
In November 2015, Bangladesh added a major new objective to its power capacity future in plans for an aggressive build-out of renewable energy. "We revised our plan earlier this year to target 15% [of electricity] from renewables by 2021, which means 3,100MW," Siddique Zobair, member of the Sustainable and Renewable Energy Development Authority of Bangladesh (SREDA), said.[77]

In addition to its recent successes in rooftop solar, the government of Bangladesh has started to focus on grid-connected solar power generation. Bangladesh's 2021 target now includes 1.7GW of solar capacity and 1.3GW wind, plus some expansion of biomass-based power capacity. Given the potential for solar development and the benefits of solar power, Bangladesh is making progress, much like India is making progress. But like India, it can do better.

Seven utility scale solar projects have been initiated in the last two years, but a very clearly stated top-of-government endorsement is needed to accelerate this potential transformation.[78]

[76] http://ep-bd.com/online/details.php?cid=33&id=19071
[77] http://reneweconomy.com.au/2016/is-dubais-new-record-about-to-set-a-new-normal-for-solar-tariffs-42945
[78] http://newagebd.net/231208/6-mega-solar-power-projects-hit-snag/

Figure 2.8 – Bangladesh Electricity Generation Capacity Transformation 2016-2021 (MW)[79]



Source: Bangladesh Power Development Board, IEEFA Research

[79] http://www.bpdb.gov.bd/bpdb/index.php?option=com_content&view=article&id=150&Itemid=16

3.0 Rampal Power Plant Financial Model

IEEFA has developed a financial model to assess the cost of the electricity produced by the Rampal plant. The model uses data from the EIA and NTPC, as well as information from published reports, news articles and interviews. It aims to further public discussion by bringing together relevant financial.

One of our key findings is the presence of a massive amount of subsidy in the proposed financial arrangement of the Rampal plant.

We find three massive subsidies by the Indian and Bangladeshi governments:

1. A tax subsidy of Tk73.6bn (US$936m) from a 15-year tax holiday provided by the Bangladesh government.
2. A financing subsidy of Tk78bn (US$988m) through a rate-subsidised loan from the Indian government's EXIM Bank.
3. An operations subsidy of US$1.9bn from the government of Bangladesh for its dredging services.

3.1 Rampal Modelling Assumptions

Our financial model, to estimate the revenue requirements for the Rampal project, makes the following key assumptions:

Power Plant Assumptions

Rampal plant stage 1 has a proposed capacity of 1,320MW. Reports suggest that the plant would be commissioned by 2021. The plant life has an estimated useful life of 40 years. We project that it will run at a Plant Load Factor (PLF) of 80% (the EIA assumes 85% PLF (see section 3.2)). We have assumed that 7% of the total power generated will be auxiliary power required to run the plant.

Figure 3.1 – Key Power Plant Assumptions

Power Plant Life (Years)	40
Power Plant Capacity (MW)	1,320
Plant Load Factor (PLF,%)	80%
Project Cost (US$ bn)	2.0
Cost per MW (US$ m)	1.5
First Full Year of Commercial Operation	2021
Auxiliary Consumption	7%

Source: IEEFA Research

Tax and Regulatory Assumptions – A US$936 Million Subsidy From the Bangladesh Government

Our model assumes a regulated return available on the equity component, which is 30% of the total capital, of 18.0% after tax—in line with NTPC's assumption in its feasibility study, even though in India the regulated return on equity is 15.5%.

We assume depreciation is taken straight line at 2.5% per year over allowable life of 40 years, which is also the likely effective operating life of the plant.

Figure 3.2 details the key tax and regulatory return assumptions for the project.

Figure 3.2 – Key Tax and Regulatory Return Assumptions

Equity Guaranteed Rate of Return	18.0%
Depreciation Rate	5.28%
Bangladesh Corporate Tax Rate	35.0%
Tax Holiday	15 years

Source: IEEFA Research

The regulated tax charged is 35%, in accordance with the Bangladesh Income Tax rules. However, income tax rules provide a 15-year exemption to coal-based power generation companies "if they sign up with the Government of Bangladesh in accordance with private sector power generation policy of Bangladesh within 30 June, 2020 and started commercial production within 30 June 2023".[80] This means a significant reduction in the required tariffs for the Rampal plant. The plant would save around Tk73.6bn (US$936m) in these tax exemptions over its 15-year tax holiday. Besides, both BIFPCL and BHEL, the EPC contractor to the plant, have been given Value Added Tax (VAT) exemptions.[81] BIFPCL has been exempted from paying VAT for 10 years, while BHEL will not be charged VAT on the machinery and equipment used in the plant. We have not considered these exemptions in our subsidy calculations.

Figure 3.3 – Tax Subsidies to Rampal Project

Annual Profit Before Tax (Tk m)	14,021
Corporate Tax Rate	35%
Annual Tax Applicable (Tk m)	4,907
Tax Holiday	15 years
Total Tax Subsidy (Tk m)	73,609
Total Tax Subsidy (US$ m)	936

Source: IEEFA Research

[80] http://www.nbr.gov.bd/contents/publication/107.pdf
[81] http://www.dhakatribune.com/bangladesh/2016/jun/14/indian-supplier-rampal-plant-get-tax-exemption

Bank Financing Assumptions – a US$988 Million Subsidy From the Indian Government

Indian power sector major BHEL is reported to have won the EPC contract for the Rampal project in February 2016[82] on the basis of a financing commitment at subsidised rates from the Indian government-owned EXIM Bank.

The EXIM Bank is expected to extend a loan of US$1.6bn to BIFPCL to cover 100% of the debt requirements of the project. Given the growing trend of Indian EXIM Bank lending through a Buyer's Credit scheme under the National Export Insurance Account, IEEFA views it as reasonable to expect that the loans to BIFPCL will be extended through this mechanism as well. In FY2015, EXIM Bank extended 42.5% of its loans through the BC-NEIA mechanism, up from 19.5% in the previous year.[83]

Under the BC-NEIA mechanism, for tenure of 8-12 years, which is the time horizon for which a project like Rampal normally looks to raise debt, the EXIM Bank usually provides debt finance at the following charges:[84]

1. An interest rate of LIBOR + 1.75%, the interest rate borne by the buyer—in this case BIFPCL. At current LIBOR rates,[85] this implies an interest rate of 2.90%;
2. An upfront principal guarantee fee of 6% on the initial principal amount lent, to be borne by the buyer (BIFPCL);
3. An interest guarantee fee of 1% per annum, on the interest portion only, to be borne by the buyer (BIFPCL); and
4. An interest rate differential of 2.0-2.5% (2.25% average), paid by the Indian exporter (BHEL) to EXIM Bank.

The effective interest rate throughout the lifetime of the loan would be about 5.2%—a huge deviation from market-driven interest costs, considering especially how Indian power players are currently able to raise debt at rates of not less than 11.5-12.0% for 10-year durations. These assumptions are consistent with the debt assumptions in the feasibility study for the Rampal project conducted by NTPC in December 2012. In that study, NTPC assumed that about 85% of the debt to be funded by loans would come from an export credit agency at an interest rate of 6.5% annually.[86]

Figure 3.4 – Key Financing Assumptions

Equity Funding	30%
Debt Funding	70%
Unsubsidised Interest Cost (%)	11.50%
Subsidised Interest Cost (%)	LIBOR + 1.75%
Interest Rate Differential (%)	2.25%
Guarantee fee on Principal (one time, %)	6.00%
Guarantee fee on Interest payments (per annum, %)	1.00%

Source: IEEFA Research

[82] http://www.thedailystar.net/business/indian-firm-wins-contract-build-rampal-power-plant-576454
[83] There have been some suggestions that the debt funding might be done under a special scheme of the Indian Ministry of External Affairs, the authors have neither found any document detailing any such scheme, nor have they come across any official statement to this effect.
[84] http://www.eximbankindia.in/sites/all/themes/exim/files/BC%20under%20NEIA%20booklet.pdf
[85] http://www.fedprimerate.com/libor/libor_rates_history.htm
[86] http://bifpcl.com/new/wp-content/uploads/2014/09/4.-Khulna-FR-Final-Rev-D-Dec-12.pdf

The interest-cost scheme amounts to a subsidy of about Tk78bn (US$988m) over the loan period.

And it is a subsidy effectively paid by Indian taxpayers to Bangladeshi consumers.

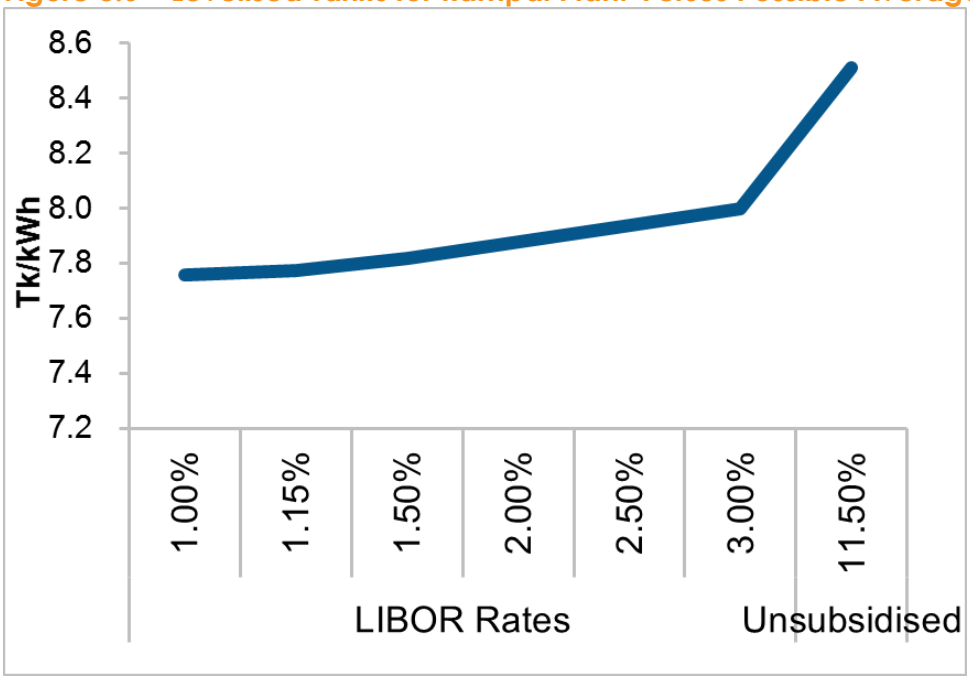
Owing to this subsidy, the cost of power from the Rampal project is expected to be Tk7.78/kWh (US9.9c/kWh) rather than Tk8.51/kWh (US10.8c/kWh), which is where it would stand without the subsidy, given current LIBOR rates. Figure 3.6 highlights the required tariffs per unit from the Rampal plant, under various LIBOR rates through the life of the loan.

Figure 3.5 – Financing Subsidies to Rampal Project From EXIM Bank

Initial Debt in 2022 (Tk m)	110,068
Average Debt over Subsidised Loan life (Tk m)	102,827
Unsubsidised Interest Rate	11.50%
Total Subsidised Interest Rate (Tk m)	5.20%
Interest Cost	2.90%
Differential Rate	2.25%
Interest Guarantee (% of Differential Rate + Interest Cost)	1.00%
One time Principal Guarantee fees	6.00%
Subsidy in Interest Rate	6.30%
Annual Interest Subsidy (Tk m)	6,477
Subsidised Loan Term	12 years
Total Interest Subsidy During Loan Term (Tk m)	77,718
Total Financing Subsidy (US$ m)	988

Source: IEEFA Research

Figure 3.6 – Levelised Tariffs for Rampal Plant Versus Possible Average LIBOR Rates



Source: IEEFA Research

Fuel Assumptions – An Annual US$26 Million Dredging Subsidy From Bangladesh

The key coal-import cost assumptions, given the specifications in the EIA are highlighted, in Figure 3.7. The likely heat rate of the power plant is estimated to be 2,447Kcal/kg, while the plant proposal is for a design that would use coal of 6,000Kcal NAR calorific value. In May 2016, a media report stated that the plant may use low-energy, high-ash content Indian coal. The inferred energy content of the Indian coal that would be imported would be 4,720Kcal/kg.

We assume the plant will rely on higher-energy-content coal, in accordance with the EIA. Accordingly, we assume a free-on-board 2022 price of US$52.40 per ton, as indicated by the current futures markets price.[87] Out model assumes international shipping costs of US$8.20 per ton in 2022—the historical mean cyclical cost—to transport coal from the source country to Akram Point. We put the cost of transporting coal from Akram Point to the plant location at US$1.64/t, with an additionally US$1.13/t coal handling cost at the plant location. These costs combined put the total landed cost of coal in 2022 at US$63.37/t.

We assume a 2% annual nominal U.S-dollar thermal coal price escalation (i.e. flat real US$ coal prices). While the current Bangladeshi Taka (Tk) per US$ exchange rate is 78.7, our model uses a 2% long-term inflation rate in the U.S as against 6% long-term inflation in Bangladesh, to arrive at an expected Tk depreciation rate of 3.9% per annum versus the U.S. dollar.

Figure 3.7 – Key Fuel Supply Assumptions

Heat Rate (Kcal/kwh)	2,447
Calorific Value Imported Coal (Kcal/kg.)	6,000
FOB Coal Cost (US$/t) – 2022	52.4
Transportation Cost from Source country to Akram Point (US$/t) - 2022	8.2
Transportation & Handling Cost from Akram Point to Plant Location (US$/t) - 2022	2.8
Initial Exchange Rate (Tk/US$)	78.7
Long Term Fuel Cost Escalation	2.0% p.a.

Source: IEEFA Research, All coal price and exchange rate data as on 20th May, 2016

In order to make the waterway navigable for coal carriers from Akram Point to the plant location, 30 million cubic metres of dredging from the Outer Bar to Mongla Port and 2.1 million cubic metres of dredging from Mongla Port to the plant site would be required. Annual maintenance dredging would be required too. The estimated annual cost of maintenance dredging for Outer Bar to Mongla Port is US$26m, a cost that would be be borne by the government of Bangladesh. This subsidy amounts to a total of US$1.9bn in nominal terms, assuming a cost inflation of 2% per annum, or US$1.04bn in real terms, over the life of the project. The plant would be charged the estimated US$4m per annum cost of maintenance dredging from Mongla Port to the plant site.

[87] http://quotes.esignal.com/esignalprod/quote.action?symbol=NCFQ-ICE

Project Capital Cost Estimate – US$2 Billion, Net of Subsidies

Project timetables and cost estimates for the Rampal project have risen repeatedly over the years, mirroring trends for most thermal power plants in the region in terms of both cost and time over-runs. Initial reports put capital costs at between US$1.2bn[88] and US$1.5bn,[89] with the former probably excluding interest-funding costs capitalised during construction. More recently, NTPC's December 2012 feasibility report put the cost of developing Rampal project at US$1.68bn.[90]

As per the latest reports, state officials say that plant costs will now be US$1.8bn, owing to additional design modifications that include a Flue Gas Desulphurisation System and covered barges for coal transportation, changes aimed to move the project closer to minimal environmental standards.[91] A report in the Indian media in April 2016 placed the cost of the project at US$2.4bn.[92]

The latest *official* estimate—of US$1.8bn—implies a cost per GW of US$1.38bn. Given the history of capital costs and time blowouts for power plants in general, IEEFA doubts that Rampal can be built for US$1.38bn per GW, especially when the International Energy Agency puts typical capital costs globally for such projects at US$2-3bn per GW. IEEFA, all things considered, has therefore used a slightly higher cost for Rampal of US$1.5bn per GW.

Accordingly, IEEFA estimates that Rampal plant capital costs would be about US$2 billion, about 9% or US$160m above the official estimates, net of the capitalised interest costs subsidised by an EXIM Bank loan. Given a four year construction program, this lower than market interest rate reduces the plant's capital cost by $262m (the 6.3% annual reduction in interest costs on the average capital employed over the four years of construction of US$1,040m - see Figure 3.8).

Figure 3.8 – Capitalised Interest Subsidy in Capital Cost (US$m)

Year	Total capital cost (US$m)	Capital employed US$m	Capex in new year US$m incl. interest	Average Capital employed US$m	Interest subsidy US$m
0		100			
1		573	473	336	0
2		1,045	473	809	0
3		1,518	473	1,281	0
4		1,990	473	1,754	0
	1,990			1,045	
Total interest subsidy (US$m)					**0**
Subsidy on interest rate					6.3%

Source: IEEFA Estimates

[88] http://articles.economictimes.indiatimes.com/2014-07-28/news/52139305_1_april-2015-award-construction-arup-roy-choudhury
[89] http://www.dhakatribune.com/development/2013/apr/19/dhaka-delhi-sign-deals-saturday-set-power-plant
[90] http://ep-bd.com/online/details.php?cid=10&id=19414
[91] http://www.thedailystar.net/rampal-power-project-runs-into-equity-funding-snag-61736
[92] http://www.moneycontrol.com/news/buzzing-stocks/bhel-surges-3epc-contractntpcs-bangladesh-jv_6208121.html?utm_source=ref_article

In Figure 3.9, on the following page, we compare capital costs per GW of proposed new coal-fired power capacity for the Rampal power plant relative to proposals being considered around the world for both Ultra Supercritical (USC) and out-dated Supercritical (SC) technologies. While the cost differential between USC and SC technologies varies from region to region, as per IEA research, USC technology is on average about 12% more expensive per GW than SC technology.

IEEFA notes that the Coal Power Generation Company Bangladesh Limited (CPGCBL) is developing a 1,200MW import coal-fired power plant at Matarbari, Chittagong. The EIA and the Feasibility Study of the Matarbari were completed in 2013-14 and a loan agreement between the government of Bangladesh and the Japan International Cooperation Agency (JICA) has been prepared (JICA is a Japanese government agency responsible for technical cooperation component of Japan's bilateral Official Development Assistance).[93] The reported capital cost is Tk360bn or US$4,625m.[94]

[93] http://web.mit.edu/urbanupgrading/upgrading/resources/organizations/JICA.html
[94] http://www.powerdivision.gov.bd/site/page/aaab501d-242c-478a-80d7-c84fc570435f/Matarbari-Project#sthash.iNU6rZ1g.dpuf

Figure 3.9 – Capital Costs for Construction of New Coal Fired Power Plants (US$m)

Project	Country	Technology	Technology Supplier	Completion	Capacity (GW)	Cost (US$ bn)	Cost (US$bn/GW)
Matarbari	Bangladesh	USC	NA (Debt funding commitment by Japan International Cooperation Agency)	2023	1.2	4.6	3.9
Luz de Atacama	Chile	USC	NA	2021	1.4	4.2	3.0
Kudgi STPP	India	USC	Doosan Heavy Industries (South Korea) and Toshiba (Japan)	2016-17	2.4	2.3	0.9
Yermarus TPP	India	SC	BHEL (India), Alstom (France) and Siemens (Germany)	2016	1.6	1.7	1.1
Gadarwara TPP	India	SC	BHEL (India)	2017-18	1.6	1.7	1.1
Khargone TPP	India	USC	BHEL and Alstom - Bharatforge (France, India)	2019	1.3	1.5	1.1
Bellary TPP	India	SC	Alstom (France) and Siemens (Germany)	2016	0.7	0.7	1.0
Batang Power Plant	Indonesia	USC	PT Adargo Energy (Indonesia), J-Power Electric Power Development Co Ltd and Itochu Corp (Japan)	2018	2.0	4.0	2.0
Jawa - 7	Indonesia	SC	China Shenhua Energy (China) and PT Pembangkitan Jawa Bali (Indonesia)	2020	2.0	5.0	2.5
Manjung Power Plant	Malaysia	USC	Alstom (France) and CMC (China)	2015	1.0	1.2	1.2
Tanjung Bin-4	Malaysia	SC	Alstom (France), Mudajaya and Shin Eversendai (Malaysia)	2016	1.0	1.1	1.1
Mae Moh Power Plant	Thailand	USC	Alstom (France) and Marubeni Corp (Japan)	2018	0.6	1.1	1.8

Source: IEEFA Estimates

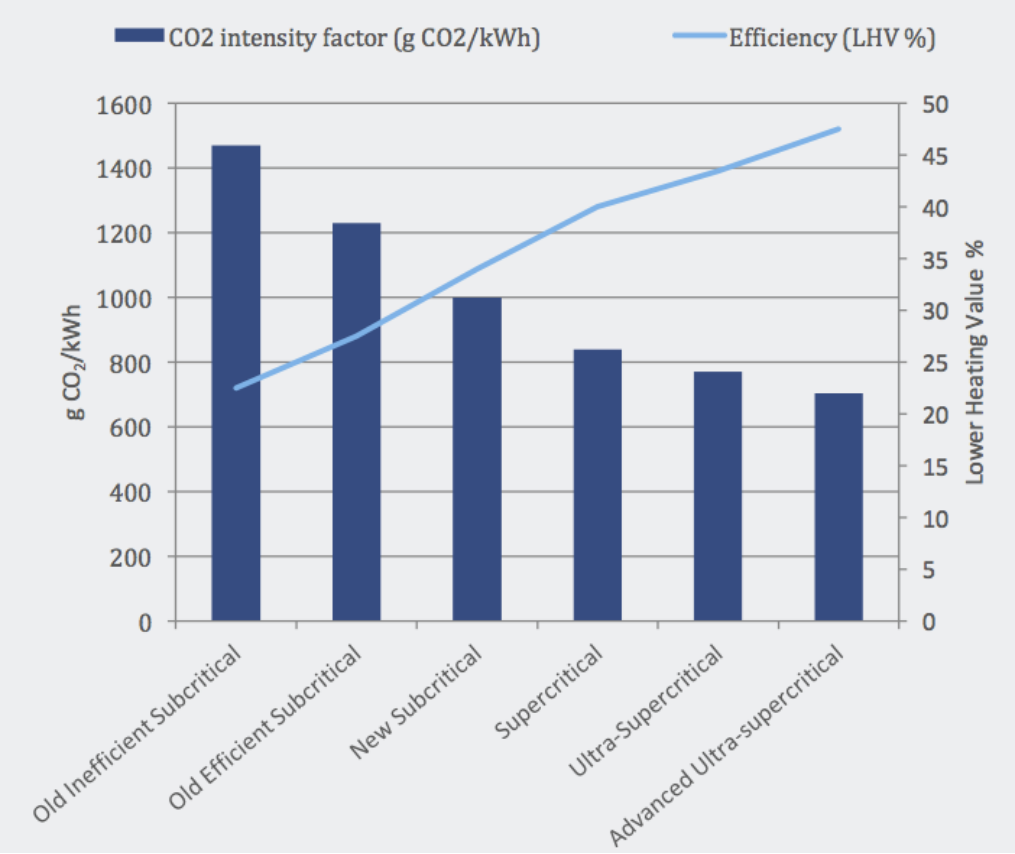
An Ultra Supercritical (USC) plant provides a net plant efficiency of up to 44% due to adaptation of this high efficiency technology, meaning less coal consumption and hence lower CO2 emissions and less ash waste. The capital cost differential relative to Rampal highlights capital cost escalation risk and / or the added environmental risk from installing out-dated technology.

Discussion of SC Versus USC Technology

Rampal's EIS puts a major emphasis on the quality of the imported coal that could be used, stating that it will be high energy (5,800-6,100kcal), low ash (<15%) and low sulphur (<0.6%).[95] Given the indication that Rampal might in fact be run using low-energy, high-ash imported Indian coal (see section 5), IEEFA questions official assumptions that minimise environmental impacts of the project.

Far more important than what kind of coal is burned is the choice of technology employed to burn it electricity.[96] This is the key to managing emissions of pollutants, carbon dioxide and waste-water discharges. In this context, IEEFA questions why Rampal is being designed around out-dated supercritical (SC) technology, rather than standard modern ultra-supercritical (USC) technology supplied largely by Japanese and Korean companies and starting to be employed in India.

Figure 3.10: Emissions Intensity and Efficiencies of Coal-Fired Power Technologies



Source: IEA, "Energy Technology Perspectives 2013"

How coal ash will be managed is also key to determining the full extent of the impacts of the Rampal proposal. The EIA claims "more than 99.9% efficient ash collection and management plant will be adopted," but provides little clarity on where the ash waste

[95] EIA Report, January 2013, page XXXii
[96] http://www.afr.com/business/mining/coal/chinas-thomas-edison---the-man-making-dirty-coal-cleaner-20160605-gpbyqq#ixzz4AkAu3Uy1

would go, suggesting only that it could theoretically be used in local brick and cement plants. In light of the waste ash disposal issues faced by most existing coal-fired power plants globally, marked by the many ash pond discharges into nearby rivers that have been reported, IEEFA is skeptical of the likelihood of responsible ash management at Rampal. The Passur River is just 100 metres from the plant's proposed ash ponds; the Moidara River is 200 metres away.

Tariffs

The Rampal power plant would require a levelized tariff of Tk9.54/kWh (US12.1c/kWh) in the absence of any subsidies.

However, the Rampal plant is set to receive three key subsidies that will affect tariffs:

1. **Income Tax Subsidy** - Bangladeshi income tax rules exempt power plants from paying income tax for a period of 15 years. Owing to this exemption, worth Tk73.6bn (US$936m) over the project life of the exemption, the estimated tariff would fall by Tk0.54/kWh (US0.7c/kWh). Additionally, both BIFPCL and BHEL, will receive VAT exemptions, that have not been considered in our subsidy calculations.
2. **Interest Rate Subsidy** - The interest rate subsidy provided in loans by the Indian EXIM Bank, estimated at over Tk78bn (US$988m) over the 12-year loan duration, would further reduce the required tariff levels by Tk0.73/kWh (US0.9c/kWh).
3. **Dredging operations subsidy** - The maintenance dredging cost subsidy by the government of Bangladesh, amounting to a total subsidy of Tk435bn (US$1.87bn), would lower the required plant tariffs by Tk0.49/kWh (US0.6c/kWh).

Beyond interest, the fuel cost is the biggest driver of the required plant tariff.

While the actual tariff levels would depend on the movements in the LIBOR rate plus the ruling imported thermal coal price and US$/Tk currency rate, we estimate—under current circumstances—that the plant will require a tariff of Tk7.78/kWh (US9.9c/kWh) net of these three subsidies.

3.2 Rampal Power Plant: Key Risks

1. The Plant Will Impose Upward Pressure on Electricity Rates

The revenue requirements of the Rampal plant materially exceed the average per-unit electricity-generation costs in Bangladesh. The plant would require tariff levels that are 32% to 62% higher than the current average cost of electricity production in Bangladesh. The higher required tariff of this plant—ranging from Tk7.78/kWh (US9.9c/kWh) at highly subsidised level of debt to Tk9.5/kWh (US12.1c/kWh) for unsubsidised debt—would push the average cost of production up and would either place a significant upward pressure on consumer tariff rates or increase the subsidy burden substantially—a bad outcome either way.

2. Significant Subsidies Fail to Rein in Costs of Rampal Electricity

The cost of electricity for the Rampal power plant is higher than Bangladesh's national average electricity cost, despite three major subsidies, which hide the true cost of the power plant.

Tax Holidays

Bangladeshi income tax rules provide a 15-year tax exemption for coal-based power plants. This implies a significant reduction in the tariffs for the Rampal plant. The plant would save around Tk73.6bn (US$936m) through these tax exemptions over its lifetime.

Indian Taxpayers to Subsidise Bangladeshi Consumers

As highlighted in section 3.1, below-market interest rates from the Indian EXIM Bank would result in a Tk78bn (US$988m) subsidy over the 12-year assumed loan period. The subsidy would effectively be paid by the Indian taxpayers to the Bangladeshi consumers. The effect of this subsidy would lower the tariff on electricity from the Rampal project by Tk0.73/kWh (US0.93c/kWh).

Maintenance Dredging to Be Paid by the Bangladesh Government

NTPC's feasibility report states that the Bangladesh government has committed to pay US$26m annually for maintenance dredging from Mongla Port to the outer bar.[97] This subsidy amounts to a total of US$1.9bn over the life of the project.

Inadequate Compensation to Traditional Landowners

Some media reports[98] state that the landowners were given compensation of Tk270,000 per acre for land to be taken by the project, whereas the market rate of nearby land is on average Tk600,000 per acre. This represents effectively a financial subsidy of Tk605m (US$8m) to the plant.

[97] NTPC Final feasibility study, December 2012, page vii.
[98] http://www.thedailystar.net/backpage/no-rampal-power-project-145024

3. More Delays Are All But Inevitable, as Are Further Increases in Capital Costs

For a variety of reasons that include community resistance, coal-fired power plants regularly take the best part of a decade to proceed through planning and construction to full commercial operation. In 2009, Bangladesh planned to have six major coal-fired power plants totalling 2,900MW of operational capacity by 2014,[99] but as of May 2016, only 230MW were operating, less than 10% of the target—and no new coal-fired power projects are due to commission in the near term.

Multibillion-dollar fossil fuel projects are complex, and delays are usually inevitable and costly, be these projects in Bangladesh, Australia, Europe or the U.S. The Rampal project is no different, and has been marred by delays since its 2010 inception. Initial project completion was scheduled for 2016.[100] Since then, it has been hampered by numerous delays and—at various points in time—various reports and official statements have put the completion dates at 2017,[101] December 2018[102] and 2019.[103] [104] In December 2015, a press article announced that BHEL had won the EPC contract for the Rampal power project, and that as part of this, the Indian EXIM Bank would provide the debt financing. However, in April 2016 BHEL had to clarify to the Bombay Stock Exchange (BSE) that no contract had yet been signed.[105] Since then, no BHEL announcement to the BSE has been forthcoming.

In an interview in 2015, the managing director of BIFPCL estimated that the commissioning of the plant would occur in 2020.[106] The last estimate assumes that financial close for the plant, which usually takes about 12 months, will be completed in 7 months, i.e. by July 2016 and that construction itself will be completed in 41 months. In our model, we assume that the plant will be commissioned at the end of 2020 and will start operating at full load in 2021. Further delays and cost increases beyond those previously disclosed will only raise the capital cost of the plant and place additional upward pressure on the tariff levels.

4. Community Opposition

Opposition from local residents poses a significant threat to the timely completion of the construction and uninterrupted operation of the Rampal plant. The project has faced significant resistance from communities in the area—residents have conducted multiple marches and public demonstrations against the plant[107]—over issues that remain unresolved. Public health risks are material, as evidenced in overseas markets reliant on coal fired power plants.[108]

Such opposition can cause further delays to the commissioning of the plant and can put at risk the social license of the plant to operate. Both are significant risks that can lead to considerable capital cost over-runs or plant shutdowns, posing significant financial risks to the plant.

[99] http://www.thedailystar.net/news-detail-91772
[100] http://www.thethirdpole.net/2015/03/12/bangladesh-struggles-to-fund-controversial-sunderbans-coal-project/
[101] http://www.thedailystar.net/backpage/three-bidders-submit-proposals-financing-166438
[102] http://ep-bd.com/online/details.php?cid=10&id=17782
[103] http://energybangla.com/bhel-from-india-get-rampal-power-plant-project/
[104] http://www.mpemr.gov.bd/news/details/85
[105] http://www.bseindia.com/corporates/anndet_new.aspx?newsid=fb210b96-2aa2-47df-ad4e-bf169bbfe7b8
[106] http://ep-bd.com/online/details.php?cid=10&id=19414
[107] http://www.dhakatribune.com/bangladesh/2016/mar/11/march-stop-rampal-plant-begins
[108] http://www.theguardian.com/environment/2016/jun/03/eu-dilutes-proposal-halve-air-pollution-deaths-uk-lobbying

5. There Is No Guarantee of an 80-85% Plant Load Factor (PLF)

IEEFA's Rampal power plant model assumes a Plant Load Factor (PLF) of 80% over the life of the project. The EIA is even more optimistic in assuming a PLF average of 85%.

We note that the average 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. In Bangladesh in 2014-15 the average utilisation rate was 63.9% (in 2013-14 it was 63%) Should the PLF of Rampal average 60% rather than our assumed 80%, the required subsidised tariff would rise by 15.8% to Tk9.0/kWh (US11.4c/kWh). Alternatively, the Rampal project would fail to deliver an adequate rate of return to its equity owners, becoming in effect a partially stranded asset if the estimated Tk7.8/kWh (US9.9c/kWh) tariff is upheld.

6. The Plant's Dependence on Imported Coal Will Expose Consumers to the Vagaries of Global Coal Markets

Global coal prices currently are at multi-year lows and are expected to remain low for the foreseeable future. Despite that fact—and despite the massive subsidies being given to the plant— tariffs from the Rampal plant would be significantly higher than the Bangladeshi average.

Given that fuel costs are 60% of the revenue requirement of the plant, any major increase in global coal prices would have a major impact on required tariffs. It is more than possible that coal costs may increase as the world adopts more stringent carbon policies post COP21. India, in its latest budget, has already imposed a "Clean Environment Cess" of INR 400/t (US$5.80/t) on domestically produced and imported coal.[109] Either electricity consumers or taxpayers in Bangladesh would have to bear any higher costs and future volatility in global coal prices and currency devaluation.

7. The Project's Location in the "Wind Risk Zone" and Within The Reach of Storm Surges

The location of the Rampal project in the "Wind risk zone" of Bangladesh[110] represents a significant financial risk to the project, since the plant would be extremely vulnerable to storm surges and, therefore, to outages and damage. The lack of a foolproof plan to counter even a normal storm surge, is glaring, as are the seemingly empirical and unscientific decisions around site development.

8. The Absence of a Clear Management Plan for Accidents and Emergencies

The seeming lack of contingency management plans in the EIA poses a risk to plant operations in unforeseen incidents. At a practical level, too, the ability of BIFPCL or the government of Bangladesh to sue shipping companies for appropriate compensation in

[109] http://indiabudget.nic.in/ub2016-17/bs/bs.pdf
[110] EIA, January 2013, Page 184

case of accidents is also questionable. These issues reflect a significant risk to the plant, since they carry a huge financial liability that does not seem to be addressed under the current plans and which may ultimately have to be borne by the people of Bangladesh.

9. Financing of Rampal Debt Endangers EXIM Bank

While the Rampal project would expose project promoters and consumers to financial risk it poses specific risks as well to the India EXIM Bank.

First, the Rampal project would constitute a large chunk of EXIM Bank's loan book.

In the Financial Year 2015 (FY2015), EXIM Bank's advances to its top 20 borrowers totalled Rs119bn. In comparison, the loan to BIFPCL would be Rs106bn (US$1.6bn) or equivalent to 89% of the total loaned to the current top 20 borrowers at the current exchange rate.

EXIM's credit exposure to it's largest borrower in FY2015 was 1.64% of total assets. In comparison, the loan to BIFPCL would be 10.7% of the total FY2015 assets. The bank's historical average of exposure to its 10 largest single borrowers (over FY2011-15) was 10.9%.

The large exposure to this project would make the EXIM Bank extremely sensitive to this loan account. If default occurs and if guarantees do not come through, the EXIM Bank's operations would be severely debilitated.

Second, the Rampal project would put the EXIM Bank's fund-raising capacity at risk.

The EXIM Bank relies heavily on foreign currency borrowings in international markets, foreign currency borrowings being 41.5% of total borrowings in FY2015. Over FY2011-15, foreign currency borrowings have been on average 49% of overall borrowings.

However, a major exposure to the Rampal project, in clear violation of the Equator principles (refer Banktrack Equator Principles Analysis of Rampal[111]), puts at risk EXIM Bank's ability to raise competitively priced borrowings in the international markets. The Norwegian Government Pension Fund Global's Council of Ethics has excluded NTPC from its investment universe, for instance, because of its sponsorship of the Rampal project. There is no reason to believe that similar action will not be taken by other investment funds against EXIM Bank, leading to a fund crunch for EXIM Bank. A list of the top investor groups that constitute the largest Bondholders of EXIM Bank is shown in Annexure V.

Third, the provision of subsidised loans to coal-fired power is contrary to COP21 Paris.

The Rampal project contradicts the global Climate Agreement reached at the COP21 in Paris in December 2015 and the continued government-subsidised funding of coal-fired power plants. A number of multilateral banks and export credit agencies in countries that are members of the Organisation for Economic Co-operation and Development (OECD) have already pledged to restrict funding for coal plants and related activities. This leaves the Indian EXIM Bank at risk that when the proposed 12-year loan matures, the bank would be unable to find other international financial institutions willing to undertake the refinancing of

[111] http://www.banktrack.org/manage/ems_files/download/rampal_equator_principles_full_analysis_pdf/rampal_equator_principles_full_analysis.pdf

Rampal, leaving EXIM with a very significant stranded loan.

Fourth, EXIM would face significant refinancing risk.

EXIM Bank is expected to provide a loan of up to 12 years duration, against an asset life of 40 years. As such—and for the reasons noted above—with 70% debt funding of the capital structure, both the BIFPCL joint venture and EXIM Bank would face a significant risk of the loan being a stranded asset and hence unable to be cost effectively refinanced.

10. The Bangladesh Electricity System Is Already Losing Nearly US$1 Billion Per Year

The Bangladesh electricity system is marked by chronically high losses and subsidies. BPDB has reported cumulative losses of Tk324bn (US$4.2bn) over the past eight years. The financial weakness of the system translates into high risk for backers.

Although operating losses are being funded primarily by government budgetary support, accounting for nearly 3% of Bangladesh's total budgetary layout of Tk2,505bn,[112] that support cannot be taken for granted.

The Bangladesh government is burdened already by high deficits (See Section 2.0) and in the event of the further deficits, it may no longer fully support electricity-system losses and BPDB may not be able to honour its commitments. This constitutes a significant risk to NTPC's initial equity investment in the Rampal plant and to a viable return from the plant in the long run. Moreover, this puts at risk the heavily subsidised proposed loan from the Indian EXIM Bank.

[112] http://www.mof.gov.bd/en/budget/14_15/brief/en/chart1.pdf

4.0 Renewables Are a Viable Alternative

Bangladesh clearly needs to diversify and expand its power generation system.

However, adding high-risk and high-capital-cost imported-coal-based capacity along the lines of the Rampal project is not a commercially viable solution. The huge potential for both distributed rooftop and utility scale solar power offers an alternative way to achieve cost-effective expansion of the power generation base while reducing Bangladesh's fuel-price risk and avoiding additional current account deficit and currency pressures. With solar radiation of 4-5kWh per square metre per day, Bangladesh has a massive solar potential—enough to generate 380TWh electricity per annum through solar PV installations.[113]

Realising just part of this potential would meet Bangladesh's medium-term electricity needs. And while the Bangladesh government has endorsed seven utility scale solar projects since 2014, almost all have seen major delays and all clearly need a Prime Minister-endorsed solar policy to provide transparency, longevity and certainty.[114] Replicating and leveraging off the brilliant progress achieved in solar in neighbouring India would dramatically transform Bangladesh's energy and growth outlook.

Limits on Available Land Favour Solar

A key constraint in Bangladesh electricity-generation development is that of land availability, be that for coal mining, thermal power generation, utility solar or hydro electricity. Bangladesh has one of the highest population densities in the world. While utility scale solar projects offer considerable potential, it is imperative that the government targets use of non-arable waste lands via the establishment of Solar Industrial Parks with government-sponsored grid transmission connectivity, as is being pursued in India. The World Bank estimates 59% of Bangladesh's total land is arable, and 11% is forested. With 66% of the population still based in rural areas, this is a key constraint that requires careful management.

Not withstanding the challenges of limited land, there is considerable scope for utility scale solar with sensible planning policies. If Bangladesh were to set an ambitious 10GW of utility solar by 2025 target, this would require 20,000 hectares of land, or just 0.15% of Bangladesh's 13.2 million total.

Rooftop solar, microgrids and solar irrigation pumps all have strong potential in Bangladesh.

Bangladesh Has Made Significant Progress in Off-Grid Solar

Bangladesh has already aggressive adoption of solar, having one of the most successful distributed solar rooftop programs globally. This program was initiated by the government-owned Infrastructure Development Company Limited (IDCOL), which provided concessional

[113] http://en.openei.org/datasets/dataset/solar-resources-by-class-and-country
[114] http://newagebd.net/231208/6-mega-solar-power-projects-hit-snag/

loans, assisted by the World Bank and developmental agencies like GIZ, KfW, ADB, IDB, GPOBA, JICA, USAID and DFID.[115]

Over 3.7 million households had installed Solar Home Systems (SHS) under this fee-for-service program by June 2015 (10% of the country's total households).[116] This expansion has been due in large part to Nobel Laureate Professor Muhammad Yunus establishing Grameen Shakti in 1996, a group that promotes and supports renewable energy technologies. This non-government organisation is the leading Bangladesh installer of SHS.[117]

The Solar Home System movement continues to grow. Every month, 60,000-65,000 additional households are installing rooftop SHS.[118] Figure 4.1 shows that by adding 66,000 SHS monthly to June 2018, and by lifting the average new system size installed to 60W, the program will see 6 million SHS installed with a total capacity reaching 257MW of distributed solar relative to 125MW in June 2015.

Figure 4.1 – Bangladesh Residential Rooftop Distributed Solar Program

Rooftop solar	Jun-15	Monthly Adds	May-16	Monthly Adds	Jun-18
Household systems	3,700,000	60,000	4,360,000	66,000	4,360,000
Average system size (W)	34	50	29	60	29
Total capacity (kW)	125,000		125,000		125,000
Total capacity (MW)	125		125		125

Source: Bangladesh Power Development Board, IEEFA calculations and forecasts

This world-leading program is providing much-needed electricity-sector diversification and new capacity while avoiding the perennial and multi-decade economic drain of fuel costs for thermal power. Given that population access to electricity in Bangladesh is calculated by the World Bank at just 60%, and with 66% of the total population being rurally based, SHS programs dramatically reduces the retail price of delivered electricity to the rural poor, acting as an extremely cost effective and timely program to reduce energy poverty and improve health and literacy.

A key consideration in all this is that the average residential rooftop system installed in U.S. and Australia in 2015 was 4,900W.[119] With the current Bangladesh SHS only 34W, the scope for significantly larger SHS installations is clear. With the program's scale and collapsing solar module costs, a doubling of the average SHS system would see residential rooftop solar capacity exceed 500MW by June 2018, several years at least before Rampal can even start generating electricity.

A significant side benefit of Bangladesh's off-grid solar program is that an estimated 200,000tpa of kerosene worth about US$180m no longer needs to be imported, a change that brings current account and currency benefits.

There are several areas of significant potential for off-grid solar applications, including: replacement of some 1.4 million diesel-fuelled irrigation pumps in Bangladesh; development

[115] http://idcol.org/home/solar
[116] Infrastructure Development Company Limited (IDCOL) Annual Report 2014-15
[117] http://www.gshakti.org/index.php?option=com_content&view=article&id=190:onemillionshs&catid=47:news-and-media&Itemid=73
[118] http://in.reuters.com/article/bangladesh-solar-idINKBN0KY0O220150125
[119] http://reneweconomy.com.au/2016/australia-5th-in-world-in-small-scale-rooftop-solar-pv-in-2015-2015

of micro-grid systems; and the industrial and commercial rooftop solar sector. Refer Annexure VI for details.

Major solar progress in Bangladesh has hitherto been off grid, which makes sense given that rooftop solar has a myriad of advantages:

1. It brings electricity immediately to the one-third of Bangladeshis who have no access to the centralised grid;
2. It underpins a democratic, easily scalable, distributed energy system;
3. It avoids the massive water usage, pollution, and waste-ash disposal problems that come from thermal power generation;
4. It does not create air and particulate pollution; nor cause the associated health costs;
5. Speed of implementation, taking less than a day rather than a decade to commission;
6. It can tap into global financial capital flows designated to facilitate emerging-market low-carbon emissions investment, such as from the World Bank's new Climate Investment Fund Clean Technology Fund and the rapidly developing global Green Bond market;
7. It has almost zero operational costs one built, avoiding imported fossil fuel costs and the resulting drain on the nation's current account deficit and resulting exchange rate and inflation pressures; and
8. It avoids land acquisition and resettlement issues.

Gains in Grid-Connected Utility-Scale Solar Power

In addition to off-grid solar, Bangladesh is now working on utility-scale renewable projects to meet its green energy targets, which recently become more ambitious. The government of Bangladesh has started to work more seriously on grid-connected solar power generation aiming for 2021 target 1.7GW of solar capacity by 2021 and 6GW by 2030. So while Bangladesh has made progress in utility-scale solar power, like India, it can do so much better.

In April 2014, the BPDB committed to building the first utility scale solar project in Bangladesh, a 7.5MW plant on 10 ha at the Kaptai Hydro-electricity facility costing Tk1,930m (US$25m), offering a Tk20/kWh tariff. BPDB reports that this facility is due for commissioning December 2016.[120]

In the following two years, nine utility scale solar project proposals have been initiated, with varying levels of progress to-date. We detail these individual projects in Annexure VII. A key observation is that while the initial capital and tariff costs are high, each subsequent proposal benefits from learning by doing and the deflationary nature of solar capital costs as technologies improve.

It is clear that Bangladesh can readily replicate and leverage many of the learnings and progress achieved in neighbouring India in terms of how to deliver a successful solar policy by the government that rapidly attracts both global and domestic partners to bring capital, technology and capacity.[121]

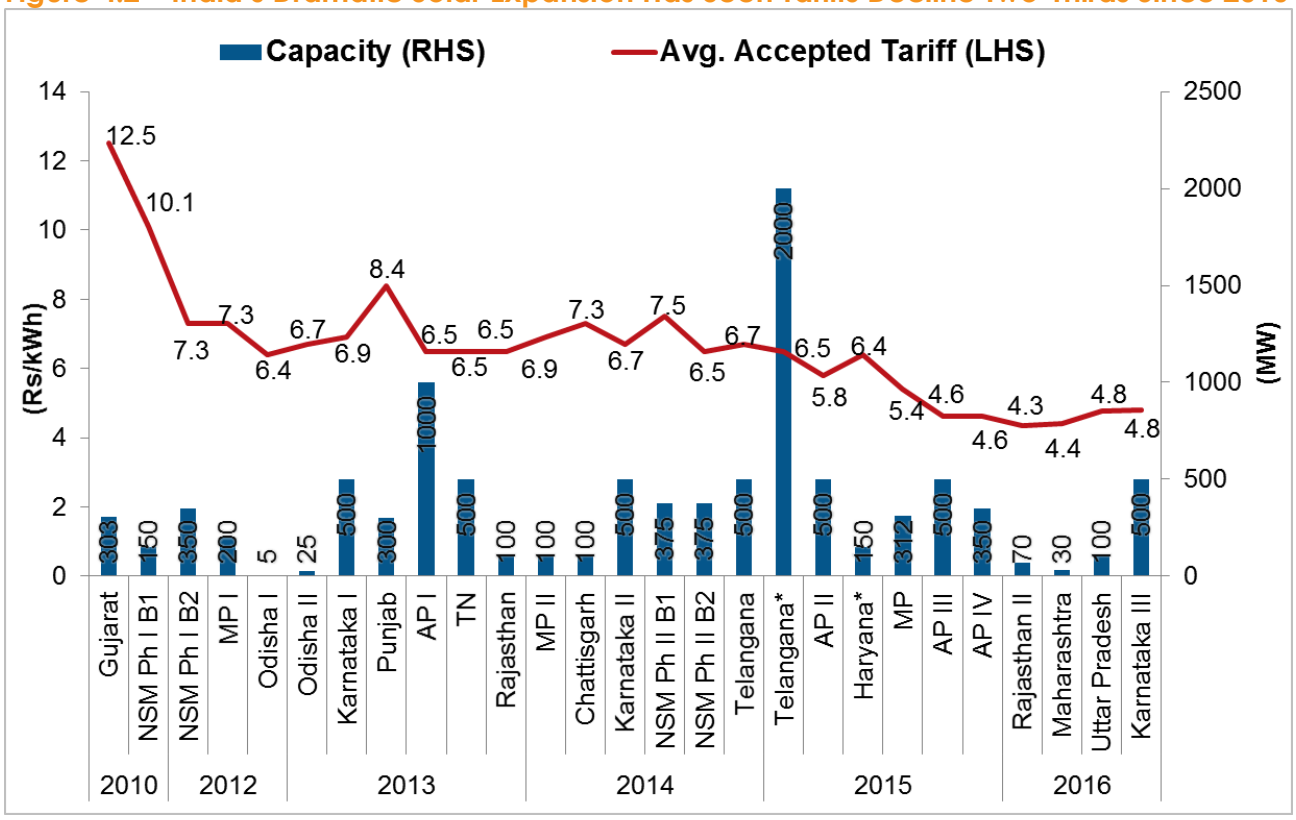
[120] http://www.dhakatribune.com/bangladesh/2014/apr/09/75mw-solar-plant-supply-power-grid#sthash.Jmq0osbI.dpuf
[121] http://www.thehindubusinessline.com/economy/india-powering-ahead-with-coal-auctions-discom-reforms-solar-plan-piyush-goyal/article8682569.ece

Great Potential in Solar Cost Decline and Expanded Utility-Size Deployment

IEEFA forecasts installed solar exceeding 60GW globally in 2016, growth of 15% year on year. This continues a trend of double0digit annual growth in installations that is being driven by continuous technology innovation and the benefits of economies of scale. The result is that the cost of solar power is declining rapidly. In May 2016, bids to develop a 800MW solar power project in Dubai were contracted at a record low solar electricity tariff of US$0.03/kWh (down almost 50% in just 16 months from previous installations).[122]

This is almost 75% below the unsubsidised cost of new imported unsubsidised coal-fired power in Bangladesh, the cost of which is estimated at US$0.12/kWh. While the cost of power from the first-of-its-kind 200MW solar plant in Bangladesh was set at a very high US$0.17/kWh, the evidence is clear that learning by doing in the local context can drive an exceptionally rapid cost decline for subsequent installations, consistent with the global trend.

Figure 4.2 – India's Dramatic Solar Expansion Has Seen Tariffs Decline Two-Thirds Since 2010



Source: IEEFA Research, India's MNRE

The chairman of Trina Solar in May 2016 forecast solar costs in China falling by 38% to US8c/kWh within four years, making them lower cost than new domestic coal-fired power.[123] This change will be assisted by an expansion in the conversion efficiency from 18% currently to 20% in this same timeframe.

[122] http://www.bloomberg.com/news/articles/2016-05-01/dubai-s-dewa-gets-5-bids-to-expand-solar-power-complex-in-desert
[123] http://www.bloomberg.com/news/articles/2016-05-23/china-s-solar-prices-can-fall-38-become-competitive-with-coal

In neighbouring India, solar plants were consistently bid at tariffs of US$0.06-.07/kWh in 2015-16, down more than 20% year on year. IEEFA expects double-digit tariff declines over the balance of this decade, consistent with the projection by First Solar Inc. in May 2016 that system and solar module costs will decline 12% annually to 2020.

Solar tariffs will drop significant as more capacity is added, as has been displayed in India. In fact, current solar tariffs in Bangladesh are reminiscent of India's experience, where solar tariffs were in the range of US$0.28/kWh in 2010 and since then have declined rapidly to US$0.07/kWh, after having hit a low of ~US$0.06/kWh in January 2016.[124] [125] This has occurred on the back of clear intent and an aggressive support policy framework from the Indian government, as well as strong investment interest from both public and private entities, both domestic and international.

There is every reason to believe that Bangladesh can benefit from an even sharper rate of decline in the cost of solar power owing to a declining learning curve by building on India's recent experience. The drop in solar power costs is already showing: Bangladesh solar plant tariff is lower than it was for India's initial tariffs.

In 2011, State Minister for Power Mohammad Enamul Huq told parliament that the Asian Development Bank was willing to finance a 10-20MW capacity Solar Thermal Power Plant inside the Kaptai Hydro-electric Plant.[126] Solar thermal technology has come a long way in the five years since then, and given the likely development of utility scale solar PV, peak demand management will require Bangladesh to develop storage capacity, including distributed solar with battery systems, hydro and solar thermal. A 10-20MW commercial deployment is a very logical first step for progressive scale-up as needed.

Solar Brings Capital Access to Global Financial Institutions

Given the Indian Government's proposed financial support of electricity capacity development in Bangladesh, it would seem financially prudent for the Indian EXIM Bank transfer it support from the Rampal plant to solar development programs instead. Such a transfer would both avoid all the negative externalities of coal-fired power generation and allow India to further accelerate its emerging position as a solar-sector world leader.

It would also open up a major new international market for Indian solar module manufacturers and EPC firms in the solar field.

IEEFA sees such a transfer as a catalyst that would attract expanded financial support of the Asian Development Bank and that would likely attract significant new debt capital support from the Asian Infrastructure and Investment Bank (AIIB) and/or the New Development (BRICS) Bank, 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, plus international firms like SoftBank, Enel of Italy, Engie of France, Fortum of Finland and SkyPower to name a few leading candidates.

We note here that the World Bank in May 2016 sanctioned a US$625m loan for Indian rooftop solar systems targeting the addition of 400MW of new distributed electricity capacity.[127]

[124] http://www.thehindubusinessline.com/news/solar-tariffs-fall-to-rs-434/article8123480.ece
[125] http://idcol.org/home/solar_ir
[126] http://heliosCSP.com/bangladesh-concentrated-solar-energy-plant-on-cards-by-2016/
[127] http://renewables.seenews.com/news/world-bank-sanctions-usd-625m-loan-for-rooftop-solar-in-india-525122

Finance for solar is ready.

Wind Energy in Bangladesh Has Potential, Albeit Limited

There are a number of studies currently ongoing to determine if Bangladesh has commercially viable potential for wind electricity generation,[128] although data from earlier measurements and analyses suggested that wind speeds in Bangladesh do not allow the development of major grid connected wind parks. Bangladesh does have many sites in its coastal areas and offshore islands which can be used to produce wind energy,[129] [130] albeit subject to extreme monsoon weather conditions.

Currently, the installed wind capacity in Bangladesh is abysmally low at around 2MW.[131]

But the Bangladesh Power Development Board has set a 2021 target of 1.3GW of wind energy and is now in the process of scoping wind capacity, installing Wind Monitoring Stations in various locations to better estimate Bangladesh's wind potential.[132] The most advanced wind project is a 60MW wind project being developed at Cox's Bazar that is likely to enter production in 2017. This joint Danish-American-Bangladesh project is being developed by US-DK Green Energy (BD) at a reported total cost of US$120m.[133]

Another 50-200MW wind power project is being planned by BPDB at Parky Beach in Chittagong.

Bangladesh Plans to Overcome the Limited Scope for Hydro

Bangladesh operates the 230MW Kaptai Hydro Power Station in the hill district of Rangamati, operational since 1962, with possible scope for a 100MW expansion.[134] The Bangladesh Power Development Board (BPDB) has identified two other sites at Sangu (varyingly reported as 58-140MW scope) and Matamuhuri (20-75MW) for hydropower plants,[135] further exploitation of larger hydropower are limited due to flat terrain of Bangladesh, as well as the considerable negative impact on local communities and heavy seasonality of monsoonal flows.[136]

There is some scope for small, distributed run of river systems, possibly 125MW in aggregate.

Both Bangladesh and India have long considered plans to overcome this geographical limitation by investing in hydro power plants in Bhutan. In May 2016 Bangladesh, India and Bhutan advanced discussions and are looking at signing a Memorandum of Understanding that would allow Bangladesh to invest in hydro power projects in Bhutan. As part of this initiative, Bangladesh plans to invest US$1bn in an equity share of Bhutan's 1.125GW Dorjilung hydropower project proposal.[137]

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[128] http://www4.uni-flensburg.de/fileadmin/ms2/proj/inees/Dcouments/Projects/wind_workshop/Prospects_of_Wind_Energy_in_Bangladesh__Dr._Abdul_Hasib_Chowdhury__Bangladesh_University_of_Engineering_and_Technology.pdf
[129] http://foundation.e-arttic.com/wiki/tiki-download_wiki_attachment.php?attId=6
[130] http://www.sdnbd.org/wind.htm
[131] http://www.bpdb.gov.bd/bpdb/index.php?option=com_content&view=article&id=26
[132] http://www.bpdb.gov.bd/bpdb/index.php?option=com_content&view=article&id=26
[133] http://www.daily-sun.com/post/108464/60MW-wind-turbine-power-by-2017
[134] http://pdf.usaid.gov/pdf_docs/Pnada885.pdf
[135] http://www.dhakatribune.com/bangladesh/2015/may/20/government-planning-new-hydro-power-company
[136] http://www.powerdivision.gov.bd/site/page/7cdf7d30-6656-41ec-aa8a-943193f30a61/R--E-Program
[137] http://www.thedailystar.net/world/south-asia/bangladesh-invest-bhutans-hydropower-sector-1225786

Biomass Energy Potential in Bangladesh

Since Bangladesh is an agricultural country and rice is one of the main agricultural products, rice husk is abundant in the country. Bangladesh produces about 6Mtpa of rice husk from about 30Mt of paddy – sufficient to power 171-500MW biomass capacity in the country.[138] [139] Rice husk is currently being used for rice parboiling, domestic cooking, poultry and fish feed.

As a measure of the potential for this as a generation source, biomass electricity generation in the US in 2015 was 64TWh, more than the entire electricity system generation of Bangladesh in aggregate.[140]

A 10MW waste to energy project is in planning by the BPDB on the outskirts of Dhaka City.

Biogas Energy Potential in Bangladesh

IDCOL has been implementing a domestic biogas program in Bangladesh since 2006 with support from SNV Netherlands, the state owned German development bank KfW and the World Bank. Biogas plants not only provide gas for cooking purpose but also produce organic fertilizer for the crops and fish ponds. The program also reduces use of biomass fuel for cooking. Till April 2014, IDCOL has financed construction of 33,000 biogas plants across Bangladesh through 24 partner organizations.[141]

The program saves 80,000tpa of firewood worth US$2m pa and replaces 28,000tpa of chemical fertilizer worth US$20m by producing 200,000tpa of organic fertilizer. The program also reduces the use of 1,000tpa of kerosene. IDCOL plans to install 100,000 biogas plants in Bangladesh by 2018.

Establishment of biogas based electricity plants in poultry farms reduces dependency on fossil fuel use in captive diesel generators. This ensures bio-security and proper litter management in these farms. Moreover, slurry produced in the digesters as by-product is a good bio-fertilizer. According to the Livestock Department, currently in Bangladesh there are 1,500 poultry farms having more than 20,000 bird populations. So, Bangladesh has good potential for biogas based electricity projects. IDCOL has so far financed 5 biogas based power plants, the largest one having a capacity of 400kW in Thakurgaon. IDCOL has a target to finance 450 such projects with an average capacity of 50 kW. The World Bank, KfW, USAID and JICA are providing support to IDCOL for these projects which could add up to an estimated 200MW of biogas electricity capacity.[142]

[138] https://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwisq_Oj0_HMAhWEIKYKHSujA1cQFggbMAA&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%2Farticle%2Fpii%2FS1364032110001449&usg=AFQjCNEZpy_bLKgVGIPi4UKJgVCOJIXpBA&sig2=bLQPt5dxCtfh3rGEALQ4qw&bvm=bv.122676328,d.dGY

[139] https://www.unido.org/fileadmin/user_media/Services/Energy_and_Climate_Change/Energy_Efficiency/2007-03_CDM_Workshop_Mexico/PPD%20Rice%20husk-based%20power%20plant,%20India.pdf

[140] http://www.eia.gov/todayinenergy/detail.cfm?id=26392&src=email

[141] http://idcol.org/home/dbiogas

[142] http://idcol.org/home/other_re

Nuclear Is Likely to Face Decade-Plus Delays

The Bangladesh Atomic Energy Commission (BAEC) is evaluating the scope for nuclear with reports in December 2015 that an agreement had been signed with Russia's Rosatom with the stated objective of building the 2.4GW Rooppur facility for a reported US$12.65bn.[143] The first unit is said to start operations by 2022 and the second by 2023.

IEEFA remains extremely sceptical that this project will ever see the light of day, given the probability of massive cost and likely decade-long time blowouts that follow almost every nuclear project globally.[144]

Renewable Power Can Provide Bangladesh With Both Timely Power and Energy Security

Bangladesh needs electricity to power its future growth and meet the current demand shortfall. However, coal based power plants takes the best part of a decade from planning to commissioning. On the other hand, India has shown solar plants can be cost effectively commissioned in 12 months and are able to add to electricity supply almost immediately.

Coal projects have been delay prone, especially in Bangladesh. This is evidenced by the lesser than expected output from Barapukuria coal mine and an 11 year delay in the Phulbari coal mine.

Renewable energy sources provide true energy security to Bangladesh, since there is no raw material requirement. On the other hand, imported coal based plants like Rampal project will expose the Bangladeshi system to both fuel price as well as exchange rate risk.

[143] http://www.world-nuclear-news.org/NN-Bangladesh-Russia-ink-12.65-billion-Rooppur-plant-deal-29121501.html
[144] http://ieefa.org/ieefa-study-india-plan-build-12-new-nuclear-reactors-economically-unviable-fraught-risk/

5.0 Indications that Rampal Is an Instrument of Indian Foreign Policy

The Rampal project is progressing only through the active, heavily subsidised financial support of the Indian government. Many aspects of the project suggest Rampal is more an instrument of Indian foreign policy rather than a commercially viable proposition.

The government of India is extending 100% of the project's debt finance through a US$1.6bn loan from the 100% government-owned India EXIM Bank for an estimated 12-year duration. IEEFA estimates the financing subsidy involved at US$988m.

NTPC (70% owned by the government of India) proposes investing an estimated US$298m for a 50% equity share in Rampal.

Bharat Heavy Electricals Limited (BHEL), the proposed builder of the Rampal power plant, is 63% owned by the Indian government[145] and won the engineering and construction contract on the strength of financial support from the Indian EXIM Bank.

The Indian government has commissioned a grid connection with Bangladesh for the supply of 600MW of electricity. However, an additional 400kW of grid connectivity from Rampal back to India is being established as part of the proposal, hinting at a possible motive of the Indian government. The proposal, by locating the plant in Bangladesh, is skirting standing regulations[146] that would preclude such a development in India.

It has also been suggested that beyond the current plan to develop India-Bangladesh rail connectivity,[147] Indian funds are being offered to establish a railway connection to the Rampal power plant as a follow-on development for a stage II expansion to double capacity from 1.32GW to 2.64GW.[148] Rather than relying on high-energy low-ash imported thermal coal, Rampal might end up being used simply as an export destination for low-energy high-ash thermal coal from Coal India Ltd (80% owned by the government of India).[149]

IEEFA's research indicates that the India EXIM Bank could fulfil its role of promoting Indian exports and international diplomacy by—rather than developing a coal-based power plant—support NTPC and BPDB in initiating a renewable-energy program by awarding BHEL an EPC contract to install a series of solar plants in Bangladesh, each at progressively lower PPA tariffs. Such a move would significantly boost India's fledgling solar manufacturing export industry; it would also augur well for the government of India's "Make in India" program and leverage India's announcement at COP21 Paris that it will show leadership toward a global solar alliance.[150]

[145] http://www.bhel.com/investor_relations/pdf/BHEL-Corporate_Presentation_June_2015.pdf
[146] http://environmentclearance.nic.in/writereaddata/Form-1A/HomeLinks/TGM_Thermal%20Power%20Plants_010910_NK.pdf, page 4-9
[147] http://timesofindia.indiatimes.com/business/india-business/Rs-1000-crore-approved-for-India-Bangladesh-rail-link/articleshow/48225940.cms
[148] http://www.daily-sun.com/printversion/details/80614/Installing-rail-line-to-Rampal-PP-for-carrying-coal-sought
[149] http://www.business-standard.com/article/companies/coal-india-hopes-to-win-orders-from-bangladesh-116053000752_1.html
[150] http://www.theguardian.com/environment/2015/nov/30/india-set-to-unveil-global-solar-alliance-of-120-countries-at-paris-climate-summit

6.0 Conclusion

IEEFA estimates the levelized cost of electricity required to build and operate Rampal project to be Tk9.54/kWh (US12.1c/kWh) at an unsubsidised rate. Despite massive Bangladeshi and Indian subsidies, estimated at a combined US$3,801m over the project life, consumers of electricity produced by Rampal project would still need to shell out Tk7.78/kWh (US9.9c/kWh), paying rates significantly higher than the current national average cost of electricity production of Tk5.9/kWh (US7.5c/kWh).

While the need for Bangladesh to diversify its power generation sources is entirely justified, adding imported coal fired power capacity exposes the Bangladeshi electricity system to international coal price and currency fluctuations, at least partly defeating the purpose of diversifying the sources of electricity. On the other hand, solar and wind power provide attractive options for Bangladesh, making strategic sense by de-risking power generation from fuel price risk and building on the success of Bangladesh's world-leading off-grid rooftop solar program. Bangladesh can 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.[151]

As a country most exposed to climate risk in terms of sea level rise and extreme weather events, Bangladesh needs to follow the 2016 leadership moves of neighbouring countries like Philippines[152] in rejecting ever more imported fossil fuel dependence.

The Rampal plant fails to address three out of the five objectives of the Bangladesh Power System Master Plan. Given the requirement for multi-billion dollar subsidies and the major externalities involved, we believe that the Rampal plant will be ineffective in providing electricity to Bangladesh at an acceptable cost. Given the major financial risks that the plant faces, the inflationary impact the plant will have on the Bangladeshi electricity system if it becomes operational and the fact that it does not meet the objectives of the PSMP, we believe that the Rampal plant should be cancelled, and the Indian and Bangladesh government energies applied to the development of sustainable industries of the future, such as utility-scale and distributed rooftop solar.

[151] http://www.climatechangenews.com/2016/04/18/solar-is-now-cheaper-than-coal-says-india-energy-minister/
[152] http://www.bworldonline.com/content.php?section=Corporate&title=fph-will-not-invest-in-coal-fired-power-plants&id=127942

Annexure I

Norwegian Government Pension Fund Global

Summary of the Council of Ethics report on exclusion of NTPC from investment universe

The Council on Ethics of the Norwegian Government Pension Fund Global (GPFG), responsible for providing recommendations to the Norwegian Ministry of Finance for exclusion of specific companies from the investment universe of GPFG, recommended in their December 2014 report that NTPC be excluded from GPFG's investment universe.[153] This recommendation to divest NTPC Ltd was accepted for implementation in February 2015.

A summary of the report is reproduced below:

"The exclusion of coal and petroleum companies is a more effective strategy for addressing climate change than the exercise of ownership and exertion of influence.

The Council on Ethics recommends the exclusion of National Thermal Power Company Ltd. (NTPC) from the Government Pension Fund Global (GPFG) due to an unacceptable risk of the company contributing to severe environmental damage through its operation in Khulna, Bangladesh.

In the form of a joint venture with Bangladesh Power Development Board, NTPC has established a company to build a large coal-fired power plant in southern Bangladesh. NTPC will be responsible for planning, building and operating the plant. The power plant is to be constructed near the border of the Sundarbans national conservation area, the world's largest mangrove forest. The area is rich in biodiversity and contains substantial conservation values, including Bengal tigers and river dolphins. The conservation area also encompasses two world heritage sites, as well as a further world heritage site on the Indian side of the border. Three factors mean that the project carries a substantial risk of environmental damage.

Both coal and other materials needed during construction and operation will be shipped to the power plant through the Sundarbans. Waste from the power plant will be removed along the same route. The sailing route to the anchorage and transhipping area is very close to the border of a world heritage site. Anchorage and transhipping operations will raise the risk of mishaps and accidents involving emissions very close to vulnerable areas. This risk is a direct consequence of the power plant's construction and placement.

The power plant will produce more than one million tonnes of ash annually, which will have to be either securely stored or bound, for example in cement. Several of the proposed uses carry a high risk of emissions of unwanted substances like mercury, arsenic and other metals into the environment and drinking water, either through their use and storage or through accidents during transportation. Many of the metals accumulate in organisms, and will be concentrated up the food chain. Some substances, like arsenic, may seriously threaten the health of the local population. The mercury in the flyash will constitute a particular risk in this area, since the chemical conditions in the river will, to a greater degree than elsewhere,

[153] http://etikkradet.no/files/2015/01/Council-on-Ethics-2014-Annual-Report.pdf

transform mercury into a form (methylmercury) that is easily absorbed and concentrated up the food chain.

The third risk relates to the extensive dredging of riverbed and seabed areas. When large volumes are removed from the riverbed or dumped, the volume of particles transported by the river increases substantially. There is a high risk that this activity may place further strain on the already endangered mangrove forest and life in the river and appurtenant marine areas, which are also important to the local population.

The Council on Ethics initially contacted NTPC in March 2014, and has had some communications with the company since then. The company takes the view that, in assessing the power plant project, emphasis must be given to Bangladesh's status as a poor country with a great need for electricity, and that the distance to the world heritage site indicates that the project does not present a particular risk of environmental damage.

The Council on Ethics considers it highly unlikely that a coal-fired power plant can be constructed at this location without the construction itself constituting a high risk of severe environmental damage, even if extensive additional measures are implemented. In the present case, the company has also failed to give sufficient consideration to what needs to be done to protect the environment. Further, various factors relating to transportation and waste management have not been addressed and handled satisfactorily. Overall, this suggests a significantly increased risk of unwanted incidents in a unique, highly vulnerable area. The Council has also given considerable weight to the strong concern expressed by UNESCO regarding the risks associated with the project, and the fact that the IFC recommendations on such situations have not been followed.

Further, the entire forest has been designated a Ramsar and Biosphere area.

Based on an overall assessment in which consideration has been given to all of the discussed matters, the Council on Ethics has concluded that there is an unacceptable risk that NTPC will contribute to severe environmental damage through the building and operation of the power plant at Rampal, including related transportation services."

Additionally, as per the Council of Ethics report, some sources state that the distance of the power plant is between 5 and 9 km from where the forest edge was when the Sundarbans national conservation area was established, as opposed to BIFPCL's claims that the distance between the power plant and the conservation area is 14 km. The report notes that the "difference between the estimates is probably due to the subsequent construction of settlements in the border zone and a resulting increase in the real distance between the site and the edge of the forest."

Annexure II

Rampal Power Plant – Environmental Impact Assessment Study: Issues of Independence

The Environmental Impact Assessment Study for the plant was conducted by the Center for Environmental and Geographic Information Services (CEGIS), a trust under the Bangladeshi Ministry of Water Resources.[154] The EIA study followed the Initial Environmental Examination (IEE) study conducted by CEGIS. However, questions have been raised on issues related to the EIA study.

The Council of Ethics, in its report recommending the exclusion of NTPC from the GPFG's investible universe, raised the following points about the EIA report:

a. Given that CEGIS, the agency that prepared the report is under the Ministry of Water Resources and therefore represents authorities, it is unclear whether BIFPCL can be responsible for an EIA report prepared by the authorities, or "whether a party representing the authorities has prepared and is in practice responsible for an environmental impact assessment that in turn forms the basis for the authorities' own operational requirements specification."

b. The fact that the EIA was commissioned by an agency under the Bangladesh Ministry of Energy, conducted by an agency under the Bangladesh Ministry of Water Resources, approved by the Ministry for Environment and for a project promoted by the Government of Bangladesh, "undermines confidence that the EIA provides and objective, comprehensive analysis."

c. The Environmental Management Plan neither mentions nor addresses unexpected accidents like shipwrecks. The EIA does not state either BIFPCL's responsibility in case of an accident, or if anyone has a responsibility for coordination during such a situation. The EIA does not address the consequences of failing to comply with the regulations.

d. The EIA structure and content is not consistent with the World Bank's normal EIA design, regarding balanced presentation of pros and cons, as well as specification of technical measures.

e. The cost benefit analysis appears to be very brief.

f. The EIA "contains no, or few, descriptions of what is required to avoid damaging the environment, and does not assess whether the proposed measures will be adequate. Nor does it draw on international experience relating to leakages from storage sites, measures to prevent sludge loss, comparable contingency systems or the risk of shipwreck."

g. While the EIA mentions this highly valuable location will suffer in the absence of strict attention, it is unclear "whether the requirements that will be imposed will be adequate, whether it will be possible to comply with the requirements at all times, and how compliance will be monitored."

[154] http://www.indiaenvironmentportal.org.in/files/file/EIA%20of%202x%20(500-660)%20MW%20Coal%20Based%20Thermal%20Power%20Plant%20at%20Rampal%20in%20Bagerhat%20District,%20Khulna1.pdf

h. The EIA proposes various disposal methods for the ash generated during the operation of the plant, but fails to evaluate "the potential health effects of arsenic dissemination in an environment that is already overloaded."

Annexure III

Top 20 shareholder list of NTPC Ltd

Investor Rank	Investor Name	Shareholding (%)	Country
1	Government of India	69.96	India
2	Life Insurance Corporation of India	12.98	India
3	T. Rowe Price International (UK) Ltd.	1.33	England
4	ICICI Prudential Asset Management Co. Ltd.	1.03	India
5	The Vanguard Group, Inc.	0.66	United States
6	Birla Sun Life Asset Management Company Ltd.	0.37	India
7	BlackRock Institutional Trust Company, N.A.	0.36	United States
8	BlackRock Asset Management North Asia Limited	0.28	Hong Kong
9	HSBC Global Asset Management (Hong Kong) Limited	0.26	Hong Kong
10	T. Rowe Price Hong Kong Limited	0.22	Hong Kong
11	Mellon Capital Management Corporation	0.18	United States
12	HDFC Asset Management Co., Ltd.	0.17	India
13	SBI Funds Management Pvt. Ltd.	0.12	India
14	Nordea Funds Oy	0.11	Finland
15	UTI Asset Management Co. Ltd.	0.11	India
16	British Columbia Investment Management Corp.	0.11	Canada
17	Dimensional Fund Advisors, L.P.	0.1	United States
18	Wellington Management Company, LLP	0.09	United States
19	Reliance Capital Asset Management Ltd.	0.07	India
20	Parametric Portfolio Associates LLC	0.07	United States

Source: Thomson Reuters, Retrieved 19th May, 2016

Annexure IV

EXIM Bank of India

Export-Import Bank of India (EXIM Bank), owned by the Government of India, has a mandate to promote Indian exports, as well as integrate India's foreign trade and investment with overall growth. EXIM Bank is in the process of extending a Buyer's Credit loan of US$1.6bn to BIFPCL.

Analysis of EXIM bank's annual reports reveals the following major points about it:

1. EXIM Bank makes a below market Return on Equity (RoE). The RoE in 2014-15 was 7.6% but this fell to 2.95% in 2015-16,[155] while the average RoE over 2009-10 to 2015-16 was 9.2%, well below the average RoEs of 14-15% that Indian Banks make.
2. The average cost of loan for EXIM Bank in 2014-15 was 6.8%, while the average interest income on loans and advances is only 5.3%. Till 2011-12, EXIM Bank made a positive margin, but it was quite small. The real profit driver is Income on Investments and Bank Balances, which in 2014-15 generated a return of 27.6% and from 2009-10 to 2014-15 made an average return of 17.2%.
3. The reported loan to BIFPCL will be extremely lumpy for the Bank:
    a. Total advances to top 20 borrowers in 2014-15 were Rs119bn. BIFPCL loan will be Rs106bn (US$1.6bn) or 89% of current top 20 borrowers at the current exchange rate.
    b. Similarly credit exposure to largest borrower in 2014-15 was 1.64% of the total assets. The BIFPCL loan will be 10.7% of the total 2014-15 assets. BIFPCL exposure will be close to the historical average of exposure to 10 largest single borrowers (from 2010-11 to 2014-15), at 10.9%.
4. Indian Government infuses capital into EXIM bank each year. In 2016-17, the Bank has asked for Rs17bn infusion to maintain the Bank's capital adequacy.
5. EXIM Bank started disbursing funds under Buyer's Credit under the National Export Insurance Account (BC-NEIA) scheme in 2011-12. In 2012-13, 3.3% of the overall loans were disbursed under this scheme, as opposed to 19.5% in 2013-14 and 42.5% in 2014-15. This rising trend indicates that NEIA route has been gaining favour in EXIM Bank's modus operandi and indicates that this deal, if it goes through, will also be financed under the BC-NEIA route.
6. Foreign currency borrowings are a substantial portion of the total borrowings of EXIM Bank. In 2014-15, foreign currency borrowings were 41.5% of total borrowings. Over 2010-11 to 2014-15, this number has been on an average 49%. This borrowing avenue is put at risk by EXIM Bank's association with the Rampal project, the way it was for NTPC. There is a realistic possibility that important international financial institutions may stop purchasing bonds issued by EXIM Bank, owing to its exposure to this project, particularly given EXIM Bank is currently able to use its sovereign status to borrow at benchmark rates.

[155] http://www.eximbankindia.in/sites/default/files/investor-pres.pdf

Annexure V

Top 25 Bondholders list of EXIM Bank of India

Investor Rank	Investor Group	Country	Value (US$ m)
1	Housing Development Finance Corporation	India	122.81
2	Tata Sons	India	117.40
3	Prudential Financial (US)	United States	111.63
4	Reliance Group	India	97.43
5	Pictet	Switzerland	87.89
6	JPMorgan Chase	United States	74.77
7	Deutsche Bank	Germany	67.20
8	IDFC	India	52.80
9	Prudential (UK)	United Kingdom	46.97
10	State Bank of India	India	41.07
11	Unit Trust of India	India	33.44
12	Allianz	Germany	33.37
13	Larsen & Toubro	India	29.83
14	Axis Bank	India	28.68
15	DSP Group	United States	26.55
16	Franklin Resources	United States	24.44
17	Aberdeen Asset Management	United Kingdom	21.44
18	Royal Bank of Canada	Canada	21.29
19	Nippon Life Insurance	Japan	19.93
20	Religare Enterprises	India	19.41
21	Sun Life Financial	Canada	19.01
22	Schroders	United Kingdom	18.91
23	Crédit Agricole	France	18.15
24	Aditya Birla Group	India	16.25
25	DZ Bank	Germany	15.97

Source: Bloomberg, Thomson Reuters, Retrieved March, 2016

Annexure VI

Opportunities in Off Grid Solar Power

Bangladesh has significant potential offgrid solar applications beyond rooftop SHS.

Solar irrigation pumps: The estimated 1.4 million diesel-fuelled irrigation pumps in Bangladesh could instead run on solar, for instance, and IDCOL targets the installation of 1,550 solar irrigation pumps in 2017 alone (a similar program in India seeks to replace 26 million diesel-fuelled irrigation pumps with solar).[156] The Sikkim Renewable Energy Development Agency (SREDA) sees the potential for 150MW of solar irrigation.[157] Analysis of the cost of end-of-grid connection costs, the high level of AT&C losses and the subsidies on sale of electricity show that solar irrigation pumps and micro grids are an extremely cost effective and rapid solution to energy poverty.[158]

Mini-grids: as part of the government's 500MW solar program, the IDCOL and World Bank target installation of 25MW of electricity from a program to install 50 mini-solar grids, plus solar-diesel hybrid power solutions in the telecom sector for off-grid mobile phone towers and the adoption of solar-powered devices. In June 2016 India announced a 500MW mini-grid investment program.

In May 2016, Gamesa unveiled in La Muela municipality, Spain, an applicable new off-grid solution, with a total capacity of over 2MW, combining three power sources—245kW of solar, a 850kW wind turbine and three diesel generators that produce 222kW each—with 500kW of battery storage.[159] The prototype is expected to generate enough power to meet the needs of 400 households and is perfect for micro-grid applications across Bangladesh. Likewise, India continues to pilot new micro-grid schemes.[160]

Industrial and commercial sector rooftop solar: Many multinational firms are committing to be 100% renewable energy self-sufficient, including major chemical and fertilizer firms like Dow Chemical Company.[161] With the right policy support, industrial-commercial expansions can bring international capital to rapidly expand electricity capacity at scale and better manage load distributions. Signs are that this is beginning to occur already. In May 2016, Punjab commissioned one of the world's largest rooftop solar projects. Covering eight rooftops across 82 acres, it involves a US$20m 11.5MW industrial installation.[162]

156 http://spectrum.ieee.org/energywise/green-tech/solar/india-plans-for-26-million-solar-water-pumps
157 http://www.powerdivision.gov.bd/site/page/7d42b92a-8f64-4778-a0a8-b38c1448620d/500-MW-Solar-Program
158 http://indianexpress.com/article/india/india-news-india/sustainable-agriculture-a-new-anand-cooperative-model-this-time-in-solar-farming-2807828/
159 http://www.pv-magazine.com/news/details/beitrag/gamesa-combines-pv--wind--diesel-and-storage-in-off-grid-system_100024549/#ixzz48ggjqPO1
160 http://www.business-standard.com/article/government-press-release/small-wind-solar-hybrid-system-to-provide-electricty-to-unelectrified-areas-116052500780_1.html
161 http://reneweconomy.com.au/2016/dow-chemical-puts-more-manufacturing-plants-on-100-renewables-75802
162 http://mashable.com/2016/05/18/india-worlds-biggest-rooftop-solar-power-plant/#mjp4oUJIFqqy

Annexure VII

Gains in Grid-Connected Utility-Scale Solar Power

In addition to off-grid solar, Bangladesh is now working on utility-scale renewable projects to meet its green energy targets. We detail the status of ground braking individual solar projects here:

In April 2014, the BPDB committed to building the first utility scale solar project in Bangladesh, a 7.5MW plant on 22 acres at the Kaptai Hydro-electricity facility at a cost of Tk1,930m (US$25m), offering a Tk20/kWh tariff. BPDB reports commissioning is due in December 2016.[163]

In November 2014, it was reported that a Chinese consortium, ETERN-CCCE (China)-Hareon, had won a Bangladesh Power Development Board tender to operate as an independent power producer on a BOO (Build, Own, Operate) basis at a tariff of $0.17/KWh or Tk13.18/KWh for a 20- year power purchase agreement (PPA). The consortium was to be awarded a contract for a 30MW solar power plant beside the Dhorola River in Kurigram.[164] [165] Updates on this project have been limited, although the BPDB targets commissioning by March 2017. We note that Hareon Solar Technology Company (one of China's largest solar energy companies), in joint venture with ReNew Power of India, commissioned a 72MW solar project in Andhra Pradesh, India, in May 2016 and so remains keen on building its operating profile in this region, if the investment conditions make sense.[166]

In October 2015, SkyPower Global of Canada announced plans to build 2GW of solar capacity over the next five years in Bangladesh at an estimated investment of US$4.3 billion.[167] While there is no recent news on how this proposition has progressed, SkyPower has made similar announcements in India in recent months and progress on those has been substantial.[168] In October 2015, SkyPower entered into a PPA with the government of Madhya Pradesh for 150MW of utility-scale solar power.[169] In February 2016, SkyPower signed a Rs 5.17/kWh (US¢7.9/kWh) PPA with the Indian state of Telangana to build 200MW of solar projects.[170] And in May 2016, SkyPower announced a joint venture proposal with BYD of China to tender for 750MW of solar with battery storage in India.[171]

In October 2015, the government of Bangladesh cleared a 200MW solar power project for construction in the Teknaf district by SunEdison Energy Holding (Singapore) at an agreed tariff of US$0.17/kWh.[172] However, the April 2016 bankruptcy of the U.S.-listed parent is likely to delay or even derail this proposal, absent a new financier taking the venture over.

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[163] http://www.dhakatribune.com/bangladesh/2014/apr/09/75mw-solar-plant-supply-power-grid#sthash.Jmq0osbI.dpuf
[164] http://www.dhakatribune.com/bangladesh/2014/nov/30/chinese-firm-get-work-kurigram-30mw-solar-power-plant#sthash.mljl8VqP.dpuf
[165] http://www.observerbd.com/2015/01/16/66835.php
[166] http://en.hareonsolar.com/index.php?c=content&a=show&id=738
[167] http://www.skypower.com/skypower-announces-2-gw-of-solar-energy-projects-in-bangladesh/
[168] http://www.pv-magazine.com/news/details/beitrag/developments-on-over-1-gw-of-new-pv-in-india_100024342/#ixzz478TcP2do
[169] http://www.skypower.com/skypower-signs-power-purchase-agreement-to-deliver-150-megawatts-of-solar-power-to-the-indian-state-of-madhya-pradesh/
[170] http://www.skypower.com/news/skypower-signs-power-purchase-agreement-to-deliver-200-mw-of-solar-energy-projects-to-the-indian-state-of-telangana/
[171] http://www.skypower.com/skypower-enters-into-agreement-with-byd-to-submit-joint-bid-for-750-mw-of-solar-energy-development-in-india/
[172] http://cleantechnica.com/2015/11/26/bangladesh-approves-200-mw-solar-power-project-sunedison/

In October 2015, the BPDB agreed to a proposal for a 20MW solar power park in Taknaf, Cox's Bazar. The BPDB signed a 25-year PPA with Joules Power Ltd for buying electricity from the solar park at a rate of $0.14 or Tk10.92 per unit.[173] Final Cabinet approval was received May 2016.

In November 2015, the state Planning Commission approved a 100MW solar project with a tariff of Tk12/kWh on 350 acres at Sonagazi in Feni, at a cost of Tk14.60bn (US$190m) with 70% of the funding to come from the Asian Development Bank via the Climate Change Fund.[174]

In addition, the government has asked public-sector power companies to set up equipment for generating electricity from solar, and feasibility studies are being carried out. A number of local and foreign private-sector companies were reported in November 2015 to be submitting preliminary proposals to invest in solar power generation, with projects ranging in size from 5-100 MW.[175]

In November 2015, state-owned West Zone Power Distribution Company Ltd (WZPDCL) said it would set up a 10MW solar power plant on Monpura Island in Bhola with commissioning due in 2016.[176] Being off-grid means current electricity on Monpura Island is Tk35/kWh from the fuel oil-based plant (and being sold for just Tk3.5). The cost will drop by two-thirds with solar at Tk13-14/kWh.

In December 2015, state-owned North-West Power Generation Company Ltd (NWPGCL) announced a US$15m, 7.6 MW solar power plant on 23 acres in Sirajganj for commissioning in 2017.[177] Tenders were called and nine mostly international proposals were submitted by March 2016.[178]

In January 2016, a 50MW solar project at Sathiakhali in Bangladesh by Pacific Consultants Co. Ltd (Japan) was approved to receive "Joint Crediting Mechanism" (JCM) carbon credits from the Japanese Ministry of the Environment.[179]

In March 2016, Haor-Bangla Korea Green Energy Ltd signed a US17c / Tk13.5/kWh PPA with BPDB on a 32MW solar farm at Dharmapasha, Sunamgonj,[180] (the US$100m project was proposed June 2015).

The BPDB has issued a letter of intent to the sponsor company Intraco CNG Ltd & Juli New Energy Co Ltd (China) for a proposed 30 MW Solar Park Project at Gangachara.

[173] http://www.dhakatribune.com/business/2015/oct/14/local-bridge-loan-be-allowed-163mw-fenchuganj-plant
[174] http://energynewsbd.com/details.php?id=119#sthash.xzz6MDZ1.dpuf
[175] http://www.reuters.com/article/bangladesh-energy-solar-idUSL8N13F16I20151120
[176] http://www.dhakatribune.com/bangladesh/2015/oct/18/10-megawatt-solar-plant-planned-monpura#sthash.2FCQc2bU.dpuf
[177] http://www.dhakatribune.com/bangladesh/2016/jan/11/76mw-solar-plant-planned-sirajganj-2016
[178] http://www.dhakatribune.com/bangladesh/2016/mar/07/9-tenders-submitted-sirajganj-solar-power-plant
[179] http://techon.nikkeibp.co.jp/atclen/news_en/15mk/011500308/?ST=msbe
[180] http://hkge-bd.com

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